SEVENTEENTH ANNUAL REPORT

OF THE

OREGON AGRICULTURAL COLLEGE

AND

EXPERIMENT STATION

FOR THE YEAR ENDING

JUNE 30, 1905

COLLEGE PRESS
1905

Board of Regents of the Oregon Agricultural College and Experiment Station.

Hon. J. K. Weatherford, *President*.....Albany, Oregon.
Hon. John D. Daly, *Secretary*.....Portland, Oregon.
Hon. B. F. Irvine, *Treasurer*.....Corvallis, Oregon.
Hon. Geo. E. Chamberlain, *Governor*.....Salem, Oregon.
Hon. F. I. Dunbar, *Secretary of State*.....Salem, Oregon.
Hon. J. H. Ackerman, *State Supt. of Pub. Instruction*, Salem, Oregon.
Hon. B. G. Leedy, *Master of State Grange*.....Tigardville, Oregon.
Hon. William E. Yates.....Corvallis, Oregon.
Hon. J. T. Apperson,.....Park Place, Oregon.
Hon. W. P. Keady.....Portland, Oregon.
Hon. William W. Cotton.....Portland, Oregon.
Hon. Walter M. Pierce.....Pendleton, Oregon.
Hon. J. D. Olwell.....Central Point, Oregon.

OFFICERS OF THE STATION.

STATION STAFF.

Thos. M. Gatch, A. M., Ph. D.....*President.*
James Withycombe, M. Agr.....*Director and Agriculturist.*
A. L. Knisely, M. S.....*Chemist.*
A. B. Cordley, M. S.....*Entomologist.*
E. R. Lake, M. S.....*Botanist.*
E. F. Pernot, M. S.....*Bacteriologist.*
George Coote.....*Florist.*
F. L. Kent, B. S.....*Dairying.*
C. M. McKellips, Ph. C., M. S.....*Chemistry.*
F. E. Edwards, B. M. E.....*Chemistry.*

SEVENTEENTH ANNUAL REPORT

OF THE

OREGON AGRICULTURAL COLLEGE AND EXPERIMENT STATION.

REPORT OF THE PRESIDENT OF THE BOARD.

Hon. George E. Chamberlain, Governor of the State of Oregon:

My Dear Sir:—I have the honor to submit the annual report of the condition of the Agricultural College of the State of Oregon for the year ending on June 30, 1905.

ATTENDANCE.

The attendance during the year has been the largest in the history of the institution; the enrollment being 680, representing all the counties of the State of Oregon, and from the indications, the attendance for the coming year will be much larger than that of the past.

FINANCIAL STATEMENT.

Up to July 1st, 1905, there have been received the following sums of money from the following sources:

Hatch Act	$15,000.00	
Morrill Act	25,000.00	
State Interest	10,305.11	
Improvement	679.44	
Chemical Breakage	1,512.25	
Local Station	1,444.86	
Special	25,000.00	$78,941.66
BALANCE ON HAND JULY 1, 1904.		
Improvement	$ 274.79	
Chemical Breakage	163.64	
Local Station	71.41	
Special	21.63	$ 531.47
Total funds received up to July 1st, 1905		$ 79,473.13
THESE FUNDS WERE DISBURSED AS FOLLOWS:		
Maintenance of Expertmental Station	$15,000.00	
College	25,000.00	
State Interest	10,200.45	
Improvement	748.80	
Chemical Breakage	404.63	
Local Station	1,230.64	
Special	21,681.14	$74,265.66
Balance		$ 5,207.47
LEAVING A BALANCE IN EACH FUND AS FOLLOWS:		
State Interest	$ 104.66	
Improvement	205.43	
Chemical Breakage	1,271.26	
Local Station	285.63	
Special	3,340.49	$ 5,207.47

MISCELLANEOUS RECEIPTS AND OTHER DISBURSEMENTS.

Source.	Amount.	Local Station.	Improvement.
Agriculture	$ 737.60	$ 737.60	
Dairy	612.66	612.66	
Horticulture	92.00	92.00	
Miscellaneous	682.04	2.60	$ 679.44
Totals	$2,124.30	$1,444.86	$ 679.44

DISBURSEMENTS BY SALARIES, INCIDENTALS, TOTALS.

DEPARTMENT OR ITEM.	SALARIES.	INCIDENTALS.	TOTALS.
Printing	$ 1,780.00	$ 1,267.09	$ 3,047.09
Agriculture	3,080.00	3,937.94	7,017.94
Horticulture	1,080.00	3,331.88	4,411.88
Botany	1,600.00	215.51	1,815.51
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Chemical breakage		404.63	404.63
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Entomology	2,680.00	386.75	3,066.75
Mechanics	4,317.50	1,403.05	5,720.55
Household Economy	1,515.00	91.78	1,606.78
Military	119.00	374.85	493.85
Library	600.00	477.33	1,077.33
Drawing	750.00	3.55	753.55
Salaries outside departments	17,531.00	.....	17,531.00
Sanitary		233.00	233.00
Furniture		1 398.26	1,398.26
Traveling expenses		1,092.60	1,092.60
Advertising		357.55	357.55
Fuel		2,087 14	2,087.14
Insurance		113.85	113.85
Postage		321.58	321.58
Freight		690.74	690.74
Telephones and telegrams		147.59	147.59
Scientific apparatus		553.15	553.15
Tools and machinery		3,489.33	3,489.33
Building repairs		1,289.97	1,289.97
Miscellaneous labor		2,115.63	2,115.63
Miscellaneous supplies		385.19	385.19
Miscellaneous and current		714.94	714.94
Cauthorn Hall		501.71	501.71
Alpha Hall		49.85	49.85
Live stock		378.50	378 50
Lewis & Clark		1,659.14	1,659.14
Totals	$41,736.50	$32,529.16	$74,265.66

MORRILL FUND.

The $25,000.00, referred to as received under the Morrill Act, is an appropriation made by Congress under the law passed on August 30th, 1890, in substance as follows:

"That there shall be and hereby is, annually appropriated, out of any moneys in the treasury not otherwise appropriated, arising from the sales of public lands, to be paid as hereinafter provided, to each state and territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may hereafter be established, in accordance with an Act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid there-

after to each state and territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic science, with special reference to their application in the industries of life, and to facilities for such instruction."

Therefore the income of the College from this fund must be expended in instruction, experimentation and illustration in agriculture and in the mechanic arts, and in underlying and relating science and literature.

IRREDUCIBLE FUND.

The Act of 1862, passed by Congress, is entitled: "An Act donating public lands to the several states and territories, which may provide colleges for the benefit of agriculture and the mechanic arts."

Section 1 of this act provides that for the support of such colleges there shall be granted "an amount of public land, to be apportioned to each state in quantity to equal thirty thousand acres for each senator and representative in Congress to which the states are respectively entitled by the apportionment under the census of 1860; provided that no mineral lands shall be selected or purchased under the provisions of this act."

Section 4 requires: "That all moneys derived from the sale of lands aforesaid by the states to which lands are apportioned, and from the sale of land script, hereinbefore provided for, shall constitute a perpetual fund, the capital of which shall remain forever undiminished and the interest of which shall inviolably be apportioned by each state which may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislature of the state may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Section 5 of said act provided: "That the grant of land and land script hereby authorized, shall be made on the following conditions, to which, as well as the provisions hereinbefore contained, the previous consent of the several states shall be signified by legisla-

tive acts; first, if any portion of the fund, invested as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the state to which it belongs, so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution of the purposes mentioned in the fourth section of this act, except that a sum not exceeding ten per centum upon the amount received by any state under the provisions of this act, may be expended for the purchase of land for sites or experimental farms, wherever authorized by the respective legislatures of said states. Second, no portion of said fund nor the interest therein shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings."

HATCH ACT.

Under the Hatch Act, being an act of Congress, approved in 1887, there is appropriated $15,000.00 to be used solely in the maintenance of an experimental station and for experiment work. It adds nothing to the income of the college for educational purposes.

No part of the money derived from these three sources can be used for buildings or building purposes. The state has appropriated money in the past to erect the necessary buildings and to provide the necessary plants for the successful carrying into effect the acts of Congress hereinbefore mentioned.

The buildings now on the ground have been sufficient up to the present time to accommodate the attendance at the College, with the exception of the building for household science and economy and a home for the girls in attendance. The legislature of 1905 made an appropriation of $50,000.00 to be used for the erection of a suitable building for that department, which, owing to the referendum's being invoked on the general appropriation bill, is not available at the present time. A building of this character is very much needed and should be constructed as soon as funds for that purpose could be provided.

A number of years ago, a building was erected for the girl's hall, which would accommodate probably thirty or forty persons and in which household economy, in all of its branches, might be taught. This building, however, is now absolutely inadequate, there being in attendance at the present time about two-hundred female students,

coming from every part of the state, and no doubt this number will be largely increased in the years of 1905 and 1906.

Household science and economy, as taught at the College, is a very important branch of the education of our young women. It includes not only the duties in reference to the household, taking care of and providing for it, but the hygienic features connected therewith.

During the present year, there was an attendance of 680 students, being an increase over last year of 150. Should this increase continue in like proportion for the coming year as it has in the past three years, a building should be erected sufficient to accommodate three or four hundred girls and so constructed that it could be added to from time to time. This building could be used to an advantage for the physical training of the young women in attendance.

The work done at the College, during the past year, has been very gratifying to the Board of Regents, and we trust, highly beneficial to the State of Oregon. The class of students in attendance has been of the best character. Their deportment and bearing have been such as to assure us that their energy and learning will be a great factor in the development of the resources of the State and that their influence will be a power in forming the character of and molding public opinion for the solidity of our institution.

LEWIS AND CLARK FAIR.

The College has made a particularly creditable exhibit at the Lewis & Clark Fair of the educational work it is doing and has done in the past. The military department participated in the opening day of the Fair and were for some ten days camped upon the grounds. This body of young men, a battalion of four hundred in line, presented a striking and fine appearance, and their deportment and behavior were such as to win commendation from the public and press of the state. I am pleased to report that in military tactics, Oregon stands third in rank with all of the agricultural colleges in the United States, and we hope to go to the first rank during the coming year.

AGRICULTURAL DEPARTMENT.

In agriculture, I beg to call your attention to the fact that the report of the Director of Agricultural Colleges and Experimental Stations, at Washington, D. C., indicates the work done at this College to be equal to any of the agricultural colleges in the Union.

Our chemical laboratory is probably one of the best, if not the

best, west of the Mississippi river, and the general appliances are modern and calculated to do the best work. Many valuable lessons have been gathered from the experiments made, and each student is instructed how to make original investigation in any work that he may undertake, even now or in the future.

All branches in agriculture are made prominent, but particular attention has been given to analysizing soils and classifying the different kinds, and ascertaining so far as possible its adaptibility and how it can be made more profitable and productive to the husbandman. Much attention has been given to grain and grasses of all kinds to determine the relative value of each, as well as its cost of production. The care and feeding of stock have received close attention and much valuable knowledge gained.

Dairying in all of its branches has received careful consideration, and a great deal of useful knowledge has been gathered and disseminated throughout the dairying districts.

MECHANICAL DEPARTMENT.

The mechanical department is supplied with the necessary machinery and appliances to successfully give instructions in the various branches of mechanism. Many young men from the farm take the mechanical course, apparently with the hope that it may assist them in their work upon the farm and supplement their fund of general information, believing that it will probably be more advantageous to them than to take simply an agricultural course.

In addition to instructing in the special departments provided by law, it has been, and is the policy of the institution to give each and every student that attends a thorough knowledge of the sciences, literature and art, and thereby prepare them to become useful, intelligent, honorable citizens in any department of life and make of them truly men and women of solid worth.

EASTERN OREGON EXPERIMENT STATION.

The Eastern Oregon Experiment Station, located at Union, Oregon, during the short period of its existence, has done a valuable service to the State in the production of grasses, vegetables and cereals of all kinds. This can be readily ascertained by the most excellent exhibit now being made at the Lewis and Clark Fair by Mr. Gammie, the present Superintendent in charge of the Station.

There are on exhibit 42 varieties of oats, 130 varieties of wheat, 112 varieties of grasses, 37 varieties of alfalfa, clover and vetch, and 120 different varieties of seeds; making over 440 varieties of oats,

wheat, grasses and seeds. Many of these varieties are new and bid fair to be of general use and become staples within the State of Oregon.

Unfortunately, however, the appropriation for continuing the experiments at this Station is held up by the referendum invoked on the appropriation bill, and it will be with the most economical management that the Board of Regents will be able to keep alive the work that is now in process of completion. No new enterprises or experiments can be undertaken.

The money appropriated by the State for carrying on this work at this Station has, we believe, been judiciously expended and the State will be amply rewarded by return of many benefits for the outlay made. I refer you to the report of the Secretary of State for a financial statement of the moneys received and disbursed for the maintenance of this Station. Respectfully yours,

J. K. WEATHERFORD,
President Board of Regents.

The Board of Regents of the Oregon Agricultural College:

GENTLEMEN:—I heartily congratulate the Board upon the good work done at the O. A. C. during the year just closed. It has been a most successful year, the attendance has been the largest in the history of the College, and the work has been such as to commend the institution to the people of the state.

The finances of the College are in reasonably good condition, as shown by the reports of the treasurer and secretary, to which I call your attention for information as to the financial condition of this institution.

I am not aware of any matters of great importance that require action on the part of the Board at the present session. There are, however, a few matters that I desire to call your attention to that require some consideration at the hands of the Board.

At the last meeting of the Board of Regents, I was instructed to submit to the Attorney General the claim of Mr. E. S. Horneday against this institution for damages to his infant daughter, who was accidentally injured while playing on the campus on October 11th, 1903.

I submitted the various communications received by me from Mr. Horneday and Judge W. S. McFadden, his attorney, together with a letter explaining the situation, as near as I could, to Hon.

A. M. Crawford, Attorney General, and on January 31st, I received his opinion, which is as follows:

OFFICE OF ATTORNEY GENERAL.

SALEM, OREGON, January 31, 1905.

Hon. J. K. Weatherford, President, Board of Regents of State Agricultural College, Albany, Oregon.

DEAR SIR:—I have examined the claim of E. S. Horneday against the State Agricultural College for damages for his infant daughter having accidentally suffered a broken leg while playing on the campus October 11, 1903. As I understand the facts from your communication, on the date above mentioned, the eleven year old daughter of the claimant was playing on the campus, and the back of a stone seat which had been erected by the class of 1903, by permission of the Board of Regents, fell down and upon the leg of said child breaking the same. The bill is presented to the Board on the ground that the Board was negligent in permitting said seat to be constructed in the way it was, and in allowing it to remain after construction.

The College is a state institution, but has been by the state created a municipal corporation, governed by a Board of Regents with power to sue and be sued. There can be no question but that the Board of Regents have the care and custody of the buildings and grounds, and should use ordinary care in keeping the same in a safe condition. The only duty the Board owes to the public is the duty which arises by implication of law, and in the case of the child, not being a member of the school, and being a trespasser, the Board would not be liable, unless they had knowledge of the unsafe condition of the seat, and I find nothing in the papers indicating such to be the fact.

Further, I have very serious doubts as to the right of the Board to divert any of the funds from the object for which it was appropriated and apply it to other uses. Therefore while my sympathy is with the injured child, I must advise the Board that, in my opinion, they must refuse to pay the claim.

Respectfully,

A. M. CRAWFORD, Attorney General.

The Young Men's Christian Association are desirous of erecting a building on the College grounds to be used by the students for purposes connected with that organization. I am advised that they have filed articles of incorporation, whereby they can perpetuate the same and can enter into contracts or a contract with the College for the purposes of building a structure and maintaining the same.

It is proposed to create a mixed board of directors, apart from the Young Men's Christian Association, apart from the Board of Regents, apart from the student body, and also apart from the Faculty of the College.

I am advised that these gentlemen will be present at this meeting and endeavor to make some kind of arrangement whereby they

can proceed with the erection of a suitable building for the purposes they have in view. If so, the matter can be by them fully explained.

I have received an offer to sell the tract of land immediately adjoining that belonging to the College, south of the Girls' Dormitory, being what is known as the Foster property for the sum of six thousand dollars including the building, or five thousand dollars without the building. I think it would be wise to purchase this property if our finances are found to be in condition that the money could be used for that purpose.

I submit herewith communications had with Dr. A. C. True, Director of the Experiment Station, U. S. Department of Agriculture, Washington, D. C., in reference to the manner in which the money received from the Hatch fund should be expended.

It will be necessary, in my judgment, to arrange, at this time, the manner of paying the various professors from the different funds, segregating so far as possible the Station funds from that of the College funds.

Doctor Evans, from the Department at Washington, inspected this Station during the early summer, and in conversation with him, I informed him that I felt satisfied that the Board of Regents, at this meeting, would readjust the salaries so as to be satisfactory to Doctor True, and as near as possible, according to his view upon that subject.

With this understanding, the Station funds were paid over to the treasurer of this institution; otherwise, the Department was inclined to hold the funds due under the Haich act, claiming that they had not been properly used by us, but a portion of it had been diverted to uses of the College.

Some three or four years since, Mr. Ashby Pierce, of the city of Albany, deeded to this College a lot in the city of Corvallis, worth about five hundred dollars. He made this deed with the idea of aiding in some small way this institution. He also included in the same deed certain property in Lincoln county, which is of small moment.

A short time since, we had an opportunity to sell the lot in Corvallis for the sum of five hundred dollars. The executive committee authorized the president and secretary to accept the offer and make a deed therefor, which they have done and received the five hundred dollars.

This money has not been appropriated to any use as yet, and your committee have been considering the advisability of beautifying the eastern entrance to the grounds. If this money should be used for that purpose, it would require an additional appropriation by this Board to make such improvements, as would be in keeping with the buildings and the grounds and to reflect credit upon the institution.

Since the last meeting of the Board of Regents, Doctor John M. Bloss, former president of this College, died at his home in Hamilton township, in Deleware county, Indiana, on April the 26th, 1905. It would be proper that this Board should take some action to commemorate the memory of the deceased. He was a gentleman of high standing and of many virtues.

The Eastern Oregon Experimental Station is a matter of deep concern at the present time and it requires at our hands careful consideration. The work of the past few years is liable to be much impaired, if not lost, owing to the fact that an appropriation made by the last legislature failed to take effect, by reason of the referendum. This institution has been making valuable improvements along the lines for which it was created, and the state can ill afford to lose the work it was doing and the results that were anticipated from it.

I requested of the Attorney General an opinion upon the status of the Experimental Station at Union and received from him a communication upon that subject, which is as follows:

OFFICE OF ATTORNEY GENERAL.

SALEM, OREGON, May 24, 1905.

Hon. J. K. Weatherford, President, Board of Regents of State Agricultural College, Albany, Oregon.

DEAR SIR:—Relative to the matter referred to this office by you some time since, to-wit: whether the Agricultural College can keep the proceeds of the farm, including rents, of the Oregon Experiment Station and apply the same to the expense of operating the Station, or whether under the provisions of Senate Bill 214, found at page 248, session laws of 1905, the same must be paid over to the State Treasurer at the end of each month, permit me to say that I am of the opinion that the entire income must be paid over to the State Treasurer monthly, under the provisions of said act. Section 1 provides "That all persons, State institutions, Commissions, Commissioners, Departments, Boards, and State officers or agents handling or having the custody or control of any property belonging to the State of Oregon or to any institution, etc., are respecttively required to act for and pay over to the State Treasurer monthly all moneys received from the income or rents of such property, or from the sale

and disposition of surplus produce, unless condemned property, etc." The words "that all persons, State institutions, etc." include every person, corporation, or board having the custody or control of any property belonging to the state or in which the title is in such board or persons, but for the use and benefit of the state.

Our Supreme Court has several times held that the Agricultural College was a municipal corporation, but that does not relieve it or its officers from the duty of accounting to the state for the income of state property under its control. There is no question but what the property held by the State Agricultural College in its own name is really the property of the state and if the Agricultural College should be discontinued by the legislature, the property purchased with funds of the state, at least, would revert to and become the property of the state, subject to be disposed of as the legislature might direct. Therefore, I am of the opinion that the officers of that institution must account to the state treasurer, under section 1 of the act above referred to. Also, I am impressed with the view that said section 1 embraces in its terms and completely covers the subject matter of section 4 of House Bill 333, laws of 1901, page 68, providing that the revenues derived from said land might be applied to the use and benefit of the Experiment Station, and supercedes the same. It is a general rule of construction of statutes that a later statute, general in its terms and not expressly repealing a prior special statute, will ordinarily not affect the special provision of such earlier statute. See Roger v. United States, 185 U. S. 87 and 88, and cases there cited. Also, The City of Buffalo v. Neal, 93 New York Supreme Court Report, page 76. Merriman v. Great Northern Express Co., 63 Minn. 543.

However, in the matter under consideration, the provisions of the later act are manifestly inconsistant with those of the former, or special act, and must, in my opinion, be considered as superceding or repealing such former act.

This view is strengthened by the fact that the annual appropriation of $10,000.00 was increased to $15,000.00 for the purpose of providing funds to be used in the place of revenues of the farm, which, prior to the act of 1905 above quoted, had been retained by the College and applied to the use and benefit of the Experiment Station. It is unfortunate that the appropriation for the Experiment Station is included in the general appropriation bill, which is suspended by virtue of the referendum petition, but I see no way to relieve the situation prior to the next session of the Oregon Legislature.

Respectfully submitted,

A. M. CRAWFORD, Attorney General.

The secretary's report shows the amount of money on hand that belongs to this institution and which was on hand prior to the taking effect of the referendum. It is to be hoped that we can use this money for absolutely necessary expenses of conducting the Station until a further appropriation shall be made for that purpose. I trust that a course may be mapped out for the guidance of those in charge of this branch of our work until the legislature shall relieve us from the embarassed condition we are now in.

The last legislature made an appropriation of fifty thousand dollars for the purpose of erecting and equipping a building to be used for teaching household science and economy, and as a dormitory for the girls that may attend the College, and fifteen thousand dollars for a drill shed and gymnasium for the young men.

This appropriation is also inavailable by reason of the referendum filed upon the appropriation bill. The building for household science and economy and as a dormitory for the girls is very much needed indeed. It is to be hoped that such a building may be had before another year.

I have had a number of communications from people engaged in horticultural pursuits in the State of Oregon, urging some action on the part of the Board, looking to the establishment of a more active department in horticulture. I trust that at this session of the Board we may employ some suitable person to take charge of that department.

Respectfully submitted,

J. K. WEATHERFORD, President.

TREASURER'S REPORT.

CORVALLIS, OREGON, July 19, 1905.

To the Honorable the Board of Regents, Oregon Agricultural College:

GENTLEMEN:—Herewith I submit my report for the year ended June 30, 1905. The vouchers and other evidences of payment are on file in the office of the Clerk and Purchasing Agent.

Very respectfully,

B. F. IRVINE, Treasurer.

INCOME FOR THE YEAR.

Station—Hatch	$15,000.00	
College—Morrill	25,000.00	
State Interest	10,305.11	
Improvement	679.44	
Chemical Breakage	1,512.25	
Local Station	1,444.86	
Special	25,000.00	$78,941.66

BALANCE ON HAND JULY 1, 1904.

Improvement	$ 274.79	
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Total funds received up to July 1st, 1905		$ 79,473.13

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BALANCES BY FUNDS.

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Chemical Breakage	1,271.26	
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MISCELLANEOUS RECEIPTS (included above) AND THEIR DISTRIBUTION.

Source.	Amount.	Local Station.	Improvement.
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Horticulture	92.00	92.00	
Miscellaneous	682.04	2.60	$ 679.44
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DEPARTMENT OR ITEM.	SALARIES.	INCIDENTALS.	TOTALS.
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Household Economy	1,515.00	91.78	1,606.78
Military	119.00	374.85	493.85
Library	600.00	477.33	1,077.33
Drawing	750.00	3.55	753.55
Salaries outside departments	17,531.00	.....	17,531.00
Sanitary		233.00	233.00
Furniture		1,398.26	1,398.26
Traveling expenses		1,092.60	1,092.60
Advertising		357.55	357.55
Fuel		2,087.14	2,087.14
Insurance		113.85	113.85
Postage		321.58	321.58
Freight		690.74	690.74
Telephones and telegrams		147.59	147.59
Scientific apparatus		553.15	553.15
Tools and machinery		3,489.33	3,489.33
Building repairs		1,289.97	1,289.97
Miscellaneous labor		2,115.63	2,115.63
Miscellaneous supplies		385.19	385.19
Miscellaneous and current		714.94	714.94
Cauthorn Hall		501.71	501.71
Alpha Hall		49.85	49.85
Live stock		378.50	378.50
Lewis & Clark		1,659.14	1,659.14
Totals	$41,736.50	$32,529.16	$74,265.66

TREASURER'S ACCOUNT—FACE OF LEDGER.

FUND.	DR.	CR.	BALANCES.
Station—Hatch	$15,000.00	$15,000.00	.....
College—Morrill	25,000.00	25,000.00	.....
State Interest	10,305.11	10,200.45	104.66
Improvement	954.23	748.80	205.43
Chemical Breakage	1,675.89	404.63	1,271.26
Local Station	1,516.27	1,230.64	285.63
Special	25,021.63	21,681.14	3,340.49
Totals	$79,473.13	$74,265.66	$ 5,207.47

REPORT OF FINANCE COMMITTEE---TREASURER'S ACCOUNT.

CORVALLIS, OREGON, July 19, 1905.

To the Board of Regents of the State Agricultural College:

GENTLEMEN:—We, your Finance Committee, would respectfully report that we have examined the books and vouchers in the office of the Clerk and Purchasing Agent of the College and Station and we find the same well kept, neat and correct.

We have checked up all the drafts and compared them with the original receipted bills on file, and we have found them correct as set forth in the report and books of the Clerk.

We have examined the report of the Treasurer of the Board for the year ended June 30, 1905, and find it correct as to the amount of money to be accounted for, namely, $79,473.13.

We find that the amount disbursed amounts to $74,265.66, and that the same is properly accounted for by the receipted bills and vouchers on file in the office of the Clerk of the College and Station.

We find that there has been expended on account of the College during the year $50,053.66; there has been expended on account of the Station during the year $16,935.48; there has been expended by authority of the Board during the year $7,296.52, leaving a balance on hand of the several funds of $5,207.47.

Respectfully submitted,

J. T. APPERSON,
B. G. LEEDY,
WM. E. YATES,
Finance Committee.

REPORT OF FINANCE COMMITTEE---APPROPRIATIONS.

CORVALLIS, OREGON, July 19, 1905.

To the Board of Regents of the State Agricultural College:

GENTLEMEN:—We would respectfully report that we estimate the income for the ensuing year, with the balance on hand, will be in the aggregate about $80,000 for the College and Station.

We would recommend that the money derived from the Morrill Act, $25,000, and the State Interest Fund, estimated at $10,000 and $15,000 of the Special Fund derived from the State through the Act of February, 1903, be appropriated for the purpose of paying salaries and incidental expenses of the College for the ensuing year.

That there be appropriated for the Station the amount derived under the Hatch Act, $15,000 and the local Station Fund, estimated at $1,500, and also that there be transferred from the Special Fund derived from the State under the Act of February, 1903, $704.84, to the Hatch Act, making $17,204.84, estimated necessary to defray the expenses of the Station work for the ensuing year when supplemented with the amount appropriated by special Act of the Legislature at its lest session of $2,500 annually to defray the necessary expenses of carrying on farmers' institute work during the coming year, under such rules as may be necessary to meet the approval of the Secretary of State who, as we understand, is to audit the expenditures made under the provisions of this act.

That the balance of the income as shown above we recommend be held to the action of the Board as to its expenditure, which would amount to $12,795.16 of the balance of the estimated income.

Respectfully submitted,

J. T. APPERSON,
B. G. LEEDY,
WM. E. YATES,
Finance Committee.

FINANCIAL ACCOUNT.

Oregon Agricultural Experiment Station, in account with the United States Appropriation, 1904–1905.

DR.

To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1905, as per act of Congress approved March 2, 1887	$15,000.00

CR.

By Salaries	$10,160.00	
Labor	2,226.64	
Publications	369.54	
Postage and stationery	40.00	
Freight and express	120.36	
Heat, light, water, and power		
Chemical supplies	160.40	
Seeds, plants, and sundry supplies	493.39	
Fertilizers	40.50	
Feeding stuffs	809.22	
Library	140.13	
Tools, implements, and machinery	144.97	
Furniture and fixtures		
Scientific apparatus	178.00	
Live stock	1.00	
Traveling expenses	98.35	
Contingent expenses	17.50	
Buildings and repairs		
		$15,000.00

We, the undersigned, duly appointed Auditors of the Corporation, do hereby certify that we have examined the books and accounts of the Oregon Agricultural Experiment Station for the fiscal year ended June 30, 1905; that we have found the same well kept and classified as above, and that the receipts for the year from the Treasurer of the United States are shown to have been $15,000.00, and the corresponding disbursements $15,000.00; for all of which proper vouchers are on file and have been by us examined and found correct.

And we further certify that the expenditures have been solely for the purposes set forth in the act of Congress approved March 2, 1887. Signed:

J. T. APPERSON,
B. G. LEEDY,
W. E. YATES,
} Auditors.

SUPPLEMENTARY REPORT.

LOCAL STATION FUND.

Balance on hand July 1, 1904	$ 71 41	
Received from sale of farm products, etc	1,444.86	
		$ 1,516.27

DISBURSEMENTS.

Labor	$ 540.00	
Seeds, plants, and sundry supplies	245.14	
Live stock	377.50	
Contingent expenses	68.00	
		$1,230.64
Balance		$ 285.63

STATE AGRICULTURAL COLLEGE OF OREGON.

CORVALLIS, OREGON, June 30, 1905.

Report of the President of said institution to the Secretary of the Interior and the Secretary of Agriculture, as required by act of Congress of August 30, 1890, in aid of Colleges of Agriculture and Mechanic Arts.

I. Condition and Progress of the Institution for the year ended June 30, 1905, especially—

(1) Changes in course or methods of instruction if of sufficient importance to warrant mention, and (2) purpose, structural character, and cost of new buildings or addition to buildings.

(1). No changes

(2). No new buildings.

II. Value of Additions to Equipment during the year ended June 30, 1905.

(a) Permanent endowment	$
(b) Buildings	
(c) Library	477.33
(d) Apparatus	553.15
(e) Machinery	3,489.97
(f) Live stock	378.50
(g) Miscellaneous	1,398 26
Total	$ 6,297.21

III. Receipts for and during the year ended June 30, 1905.

Balance on hand, July 1, 1904			$ 531.47
1. State aid.	(a) Income from endowment granted by State		$
	(b) Appropriation for current expenses		
	(c) Appropriation for buildings or for other special purposes		25,000.00
2. Federal aid.	(a) Income from land grant, act of July 2, 1862		10,305.11
	(c) Additional endowment, act of August 30, 1890		25,000.00
4. Fees and all other sources.	(b) Incidental fees		1,512.25
	(c) Miscellaneous receipts, farm, etc.		2,124.30
5. Total			$64,473.13
6. Federal appropriation for experiment station, act of March 2, 1887			15,000.00

IV. Property, year ended June 30, 1905.

Value of all buildings, $160,000; of apparatus, $45,000; of machinery, $23,000; Total number of acres in farm and grounds, 203.63; acres under cultivation, 110; acres used for experiments, 50; value of farm and grounds, $31,000; number of acres of land allotted to State under act of July 2, 1862, 90,000. Amount of land-grant fund of July 2, 1862, $193,778. Number of bound volumes in library, June 30, 1905, 4000.

V. Professors and Instructors during the year ended June 30, 1905.

1. College of Agriculture and Mechanic Arts:	MALE.	FEMALE.
(a) Preparatory classes or schools		
(b) Collegiate or special classes	28	5
(c) Total, counting none twece	28	5
2. Number in all other departments (avoiding duplication)		
3. Number of staff of experiment station	12	

V. Students during the year ended June 30, 1905.

	MALE.	FEMALE.
1. College of Agriculture and Mechanic Arts:		
(a) Preparatory classes or schools	60	15
(b) Collegiate classes	370	116
(c) Post-graduate courses	4	7
(d) Short or special courses	42	66
Total, counting none twice	476	204

2. Number in all other departments (excluding duplication) ----
3. Number of college students in regular four year courses of study in agriculture, 67; mechanical engineering, 125; electrical engineering, 21; mining engineering, 45; household economy, 83.
4. Number of students in short or special courses in agriculture, 46.
5. Number of students in course of study in veterinary medicine, in pharmacy, 63.
6. Number of students in military drill, 476.
7. How many students graduated from undergraduate college courses during the year ended June 30, 1905: Men, 34; women, 16.
8. Average age of students graduated from undergraduate college courses during year ended June 30, 1905: 22 years, nearly
9. What degrees and how many of each kind were conferred during year ended June 30, 1905: On men, Bachelor of Science, 34.
On women, Bachelor of Science, 16
19. What and how many honorary degrees were conferred during year ended June 30, 1905? None.

THOS. M. GATCH, President.

REPORT OF THE PRESIDENT OF THE COLLEGE.

To the Honorable Board of Regents of the Oregon Agricultural College and Experiment Station:

GENTLEMEN:—I beg leave to submit my report for the College year ending June 14, 1905.

CONDITION AND PROGRESS.

There were 680 students enrolled, or, 150 more than were enrolled the preceding year. Of this number 476 were men and 204 were women. The Freshman class numbered 304.

It has been a year of honest work and ceaseless activity among all the instructors and nearly all the students. The percentage of failures in examination has been less than for many years past.

MECHANIC ARTS.

The Oregon Agricultural College is dependent for its existence on the Land Grant Act of '62 and the Act of August 30, 1890. By whatever name we call our College, we must make it in accordance with these Acts "a College for the benefit of agriculture and the mechanic arts." If we be true to our trust neither agriculture nor the mechanic arts will be neglected.

Our Mechanical Hall would be a splendid building for most educational purposes were it free from shops and the heavy machinery. The vibration caused by the machinery interferes with tests and all finer work requiring careful adjustment of apparatus, while

the noise resulting therefrom makes it impossible at times for a teacher in an adjoining room to be heard.

I hope the time is not distant when the Pharmacy Department will be placed in better quarters and the old building, now devoted to Pharmacy, will be torn down. A large one-story, brick or stone building should be erected on that corner with, perhaps, a wing on each street. In this should be placed our shops and machinery. If we keep pace with other Agricultural Colleges, pattern-making must be introduced and a foundry established.

If we had a proper building I have no doubt one of our great railroad companies would present us with a locomotive which, although in a captive condition, could be made not only to work, but to illustrate many problems connected with locomotive engineering. This has proved successful in some of our more advanced Agricultural Colleges. A new and interesting study is thus opened up and a larger number of students are prepared for a useful vocation.

THE CHAPEL.

During the past year we have had at the same time 100 more students than could be accommodated in our Chapel, even in a crowded condition. If it can be done without injury to the main building the chapel and library ought to be extended about thirty feet westward.

SALARIES.

April 10, 1905, I addressed this note to the Presidents of the Agricultural Colleges and Experiment Stations in the United States:

"You will confer a favor by letting me know what salaries are paid in your College and Station.

Please fill the blanks in this paper and remit by enclosed envelope.

Average salary of (a) Head Professors.

" " " (b) Associate Professors.

" " " (c) Assistant Professors.

" " " (d) Instructors."

Following is a summary of the answers received:

Alabama—Polytechnic Institute, Auburn: (a) $2,000; (b) $1,600; (c) $1,200; (d) $8,00.

Arizona—State University, Tucson: (a) $1,800, Professor and Director of Experiment Station, $2.500; (b) $1,500; (c) $1,200; (d) $1,000.

Arkansas—State University, Fayetteville: (a) $2,000; (b) $1,500; (c) $900; (d) $700.

Colorado—State Agricultural College, Fort Collins: (a) $1,800; (b) $1,200; (c) $1,000; (d) $750.

Connecticut—Agricultural College, Storrs: (a) $2,000; (b) $1,500-$2,000; (c) $1,200-$1,400; (d) $600-$1,000.

Florida—State University, Lake City: (a) $1,400; (b) none; (c) $1,000; (d) $600.

Georgia—College of Agriculture and Mechanic Arts, Athens: (a) $2,000; (b) Adjunct $1,500; (c) none; (d) $1,200. Salaries will be increased 20 to 25 per cent. in June.

Idaho—State University, Moscow: (a) $1,800; (b) $1,500-$1,650; (c) $800-$1,000.

Illinois—State University, Champaign: "I regret to state we have no average salary for professors and instructors in our College."

Indiana—Purdue University, Lafayette: (a) $2,000; (b) and (c) $1,400-$1,600; (d) $800-$1,200.

Iowa—College of Agriculture and Mechanic Arts, Ames: (a) $2,500; (b) $1,800; (c) $1,200; (d) $900.

Kansas—State Agricultural College, Manhattan: (a) $1,650-$2000; (b) $1,300-$1,500; (c) $1,000-$1,200; (d) $600-$800.

Kentucky—Agricultural and Mechanical College, Lexington: (a) $2,000; (b) and (c) $1,200-$1,400; (d) $600-$900.

Louisiana—State University, Baton Rouge: (a) $2,000; (b) $1,600; (c) $1,200; (d) $600.

Maine—State University, Orono: (a) $1,800; (b) $1,500; (c) $1,200; (d) $800. "We pay instructors for three years, $600, $800, $1,000."

Maryland—Agricultural College, College Park: (a) $1,500; (b) $1,000; (c) $750; (d) $500. "We have, however, in addition to this, a plan of paying an extra $150 to a Professor of the College who is connected with Experiment Station work; and an additional $150 if he is also connected with State work."

Massachusetts—Agricultural College, Amherst: "In President Goodell's absence from home, it is impossible to give you the information you desire."

Michigan—State Agricultural College, Agricultural College: (a) $2,000; Director $2,000 and home; Professor of Agriculture $2,200 and home; (b) none; (c) $1,000-$1,400; (d) $500-$900.

Minnesota—State University, St. Paul: (a) $2,400; (b) $2,000; (c) $1,500; (d) $1,000.

Mississippi—Agricultural and Mechanical College, Agricultural College: (a) $2,000 and house; (b) $1,500; (c) $1,200; (d) $600-$1,000.

Missouri--State University, Columbia: (a) $2,400; (b) none; (c) $1,400; (d) $1,300.

Montana—College of Agriculture and Mechanic Arts, Bozeman: (a) $1,800; (b) none; (c) $1,500; (d) $1,000.

Nebraska—State University, Lincoln: (a) $2,200; (b) $1,500; (c) $1,360; (d) $600-$1,200.

Nevada—State University, Reno: (a) $1,800-$3,000; (b) $1,500; (c) $1,200; (d) $600-$900.

New Hampshire—College of Agriculture and Mechanic Arts, Durham: (a) $2,000; (b) $1,450; (c) $1,000; (d) $700.

New Mexico—College of Agriculture and Mechanic Arts, Mesilla Park: (a) $1,800; (b) none; (c) $1,200; (d) $600-$1,000.

New York—Agricultural Experiment Station, Geneva: (a) Heads of Departments $1,800-$2,500, houses in some cases; (b) $1,500; (c) $720-$1,200; (d) none.

New York—Cornell University Agricultural Experiment Station, Ithaca: (a) normally $3,000, some of them more; (b) none; (c) $1,500-$2,000; (d) $600-$1,000.

North Carolina—College of Agriculture and Mechanic Arts, West Raleigh: (a) $2,000; (b) none; (c) $1,200; (d) $900.

North Dakota—Agricultural College, Agricultural College: (a) $1,800-$2,200; (b) $1,200-$1,400; (c) $1,000-$1,200; (d) $800-$1,000.

Ohio—State University, Columbus: [a] $1,700-$2,500; [b] $1,200-$1,800; [c] $1,000-$1,700; [d] $800-$1,300.

Oklahoma—Agricultural and Mechanical College, Stillwater: [a] $1,600; [b] $1,200; [c] $1,000; [d] $720.

Pennsylvania—State College, State College: "We have no such established scale of salaries as would enable us to make any statement even of averages.

The whole subject with us is in a state of flux. We are trying to reach some kind of settled basis, and shall probably do so after a time."

Rhode Island—College of Agriculture and Mechanical Arts, Kingston: [a] $1,700-$2,000. "Too low, would have basis $2,000 if we could." [b] none; [c] none; [d] $600.

South Carolina—Clemson College, Clemson College: "* * * * I am confident, therefore, that if I attempted to answer the questions you ask in your letter, I would not be able to convey to you any intelligent information which would be of service to you and at the same time do justice to the College."

South Dakota—Agricultural College, Brookings: [a] $1,800; [b] $1,200; [c] $1,000; [d] $800.

Tennessee—State University, Knoxville: [a] $2,000; [b] $1,600; [c] $1,200-$1,500; [d] $900. "Our salaries are too low, but our funds are limited."

Texas—Agricultural and Mechanical College, College Station: [a] $2,250; [b] $1,500; [c] and [d] $900-$1,200.

Vermont—State University, Burlington: [a] $2,000; [b] $1,500; [c] $1,200; [d] $500-$750.

Virginia—Agricultural and Mechanical College, Blackburg: [a] $1,900; [b] $1,400; [c] $1,000; [d] $300.

Washington—Agricultural College and School of Science, Pull-

man: [a] $1,600-$2,000; [b] $1,600; [c] $1,200-$1,500; [d] $720-$1-200.

West Virginia—State University, Morgantown: [a] $2,000-$2,-200; [b] $1,500-$1,700; [c] $1,200-$1,500; [d] $800-$1,200.

Wisconsin—State University, Madison: [a] $3,500-$2,500; [b] $2,000-$1,700; [c] $600-$400; [d] $1,000-$600.

Wyoming—University, Laramie: [a] $1,800, Director $2,000; [b] $1,200-$1,500; [c] and [d] $1,000.

While in attendance and efficiency our College is among the first, yet the salaries of our professors are among the very lowest paid by Agricultural Colleges. In fact only two of those reporting are as low as ours and one of these, Oklahoma, is scarcely organized. All others are considerably in advance. It is worth noting, too, that when the standard on which our present salaries are based, was adopted the cost of living was probably 20 per cent. lower than at present. The pay of all of our instructors beginning with heads of departments and going down the list should be materially increased. If this is not done we will lose some of our most capable teachers. *We* want those who are wanted elsewhere. The College has funds to meet this advance as well as to secure additional assistance in some of the departments.

THE ARMORER.

Capt. Frank L. Winn, 12th Infantry, who inspected our battalion and Armory May 19, 1905, in his report to the Department, says: "The cadets are not held to individual responsibility for the condition of their arms and equipments which I think is a mistake. They are perfectly serviceable but not kept in the fine condition required in the regular service and many are rusty. They also contained too much free oil for inspection." From this it is evident that the experiment of hiring an armorer, though worthy of trial, is not altogether successful. I would suggest that at the expiration of the armorer's time the care of the room be placed in charge of our head janitor, Mr. Erwin. If on trial it is found that it is impracticable for the cadets to look after their own guns as they did in former years, then this service should be given to students who are anxious to work to help pay their expenses.

THE GOOD ROADS QUESTION.

As the College maintained principally by the bounty of the general government we ought to second the efforts of that government in encouraging the building and maintenance of good roads. Besides, while instruction in this subject is not foreign to the spirit

and purpose of any College in the State, it is peculiarly appropriate that an industrial school like ours should lead in the work.

If the Board is not ready for more decided measures, we hope, at least, such assistance in class-work can be given our Professor of Mathematics and Engineering, and such instruments can be purchased for his department, as will enable him to give a thorough and practical course in the location, construction and repair of highways.

GRADUATES.

A class of 50 graduated June 14, 1905. The President of the Board presented the diplomas and the degree of Bachelor of Science was duly conferred on each member. The names of the graduates and the titles of their theses are as follows:

Household Science.

General Sanitation and Disinfection ..... Lura Lovene Flett
The Important American Novelists of the Last Half of the Nineteenth Century ..... Violet Philendia Herbert
Deterioration of Food-stuffs by the Activities of Micro-Organisms ..... Alice Jones
The Cultivation of Roses for Home Decoration ..... Mabelle Bee Keady
History, Composition, and Making of Bread ..... Edna Marie Osburn, Georgia Ellen Herbert
Representative Writers of the Elizabethan Era ..... Lucille Jean Roberts
Emerson's Place in American Letters ..... Maude Ethel Roberts
Rose Culture in Oregon ..... Edna Louise Smith
Carnations ..... Nellie Vernon Skelton
The Propagation and Cultivation of Certain Greenhouse Plants ..... Lena Belle Tartar
The Cultivation and Propagation of the Viola ..... Bessie Margaret Yates

Agriculture.

Effect of Temperature on Babcock Readings ..... Fred Austin Hills
Live Stock—the Farmer's Safest Asset ..... Harvey Earle Rinehart
Animal Nutrition ..... Ralph Curtis Shepard
Value of Paraffin in Cheese Curing ..... Otto Gerald Simpson
The Efficiency of Farm Cream Separators Under Farm Conditions ..... Ira Parker Whitney
Relation of Butter Fat to Other Milk Solids ..... Karl Steiwer, Floyd Williams

Pharmacy.

On the Saccharomyces and Their Enzymes ..... Albert Louis Henning
Sanitary Analysis of Some Potable Waters of the Willamette Valley ..... Bert Trew Jordan
A Chemical Analysis of Sagebrush ..... Bert Pilkington
A Chemical and Bacteriological Examination of Rock Creek Water, at a Point where the Proposed Corvallis Supply is to be Taken ..... Fred Charles Stimson, Henry Clay Darby
Deterioration of Food-stuffs by the Activities of Micro-Organisms ..... Leone Charlotte Weber
Distribution of Micro-Organisms by Flies ..... Otto Adam Weber

Mechanical Engineering.

An Original Survey of the City of Corvallis ..... Floyd Bushnell Davis, Theodore Alexander Garrow
Care and Management of Steam Boilers ..... Mark Dow McCallister
A Test of Materials ..... Ray Lewis Stout, John Rhoderick Sim McCormick
The Great Canals of the World ..... Merrill Bruce Moores

Electrical Engineering.

The Theory, Design and Construction of a one-fourth Horse-Power Induction Motor ..... Percival Lysander Adams, John Smith Tannock

A Written Thesis on the Variable Speed, Alternating Current Motor.....
..... George Anthon Anderson
The Electromagnetic Clutch.....William Henry Beaty, Guy Sherwood Moore
Multiple Wire, and Polyphase Distribution of the Electric Current.....
..... William Gustave Abraham, Albert Burton Bower
An Original Survey of the City of Corvallis.....Harry Lee Fryer, Joseph Clare Henkle
A Study of the Relation Between Specific Gravity and Specific Resistance of Various Electrolytes.....Delbert Waldorf Proebstel, John Will Carlson

Mining Engineering.

The Exploiting of an Imaginary Ledge.....Charles Edward MacLean
Coals of Oregon—Their Composition and Analysis.....Francis Marion Stokes

Literary Commerce.

The Nature of Contracts.....Mary Cecil Danneman, Alice Minerva Wicklund
Civil Code and Constitution of Oregon.....Earnest Eddy
The Expansion of American Commerce.....Leroy Harlan
Rose Culture in Oregon.....Hazel Blanche Raber

Accompanying find reports of the Director of the Station and the heads of departments. Respectfully,

THOS. M. GATCH, President.

REPORT OF REGISTRAR.

CORVALLIS, OREGON, June 24, 1905.

President Thos. M. Gatch, Oregon Agricultural College:

Dear Sir:—The total enrollment for the school year just ended was 680—476 men; 204 women. The increase in attendance over the previous year was 28 per cent. Also there was a larger percentage of students present at the beginning and at the close of the year than ever before. The attendance last year was about seven times as large as it was the first year after the school organized as a state institution. The attendance since the organization mentioned has been as follows:

1889, 97; 1890, 151; 1891, 201; 1892, 208; 1893, 282; 1894, 240; 1895, 261; 1896, 397; 1897, 316; 1898, 336; 1899, 338; 1900, 405; 1901, 436; 1902, 488; 1903, 541; 1904, 530; 1905, 680.

Although the growth in attendance last year was general, an increase of about one hundred students came from Douglas, Harney, Klamath, Lake, Lincoln, Malheur, Umatilla, Union and Wasco.

Last year the students were classified according to courses of study as follows:

Mechanics and Electricity, 146; Agriculture, 67; Household Science, 83; Pharmacy, 63; Literary Commerce, 82; Mining, 45;

Graduate Course, 11; Specials, 33; Subfreshmen, 75; Music without other studies, 29.

During the year just ended there were less subfreshmen and special students in music than there were the year previous.

In point of attendance the six banner counties of the state are Benton, Multnomah, Linn, Marion, Union, Clackamas and Wasco, as shown by the following:

Students Classified by Counties, States and Foreign Countries.

For four months ending January 17, 1905.

Baker	5	Lincoln	10
Benton	131	Linn	51
Clackamas	32	Malheur	13
Clatsop	10	Marion	36
Columbia	11	Morrow	3
Coos	7	Multnomah	52
Crook	5	Polk	21
Curry	2	Sherman	6
Douglas	18	Tillamook	7
Grant	2	Umatilla	17
Gilliam	3	Union	35
Harney	16	Wallowa	1
Jackson	14	Wheeler	0
Josephine	5	Wasco	30
Klamath	11	Washington	21
Lake	8	Yamhill	23
Lane	11		

Number of counties in Oregon	33
Total number of counties represented	32
Whole number of students from Oregon	617
Arkansas	1
California	7
Colorado	2
England	1
Idaho	3
Illinois	3
India	3
Iowa	3
Kansas	2
Missouri	1
Nebraska	12
New Hampshire	1
South Dakota	1
Tennessee	1
Utah	1

A larger percentage of students passed in their classwork at the close of last term than at the close of any other term for the last four years.

Very respectfully,

J. B. HORNER, Registrar.

DEPARTMENT OF FLORIST AND GARDENER.

President Thos. M. Gatch, Oregon Agricultural College:

Dear Sir:—I have the honor of reporting to you an account of work done on campus and grounds during the year commencing July 1, 1904, to July 1, 1905.

GREENHOUSES.

The three greenhouses have received good attention during the year, both in regard to repairs and care of plants therein. The staging has to be put in order often owing to its unsound condition; this I have done on all suitable occasions, such as wet days when the men could not work outside. Owing to the increased demand for additional plants for the campus during the Summer, I had to construct hanging shelves from the roof in order to have anything like a sufficient number of plants.

PLANTS.

At the different seasons the houses have been kept gay with the following flowering plants:

In early Fall, chrysanthemums; after the latter season was over, primulas and cinerarias; during Spring, azalias, Lady Washington and zonal geraniums, and fuchsias.

The large greenhouse is mostly taken up by large palms, crotons, ferns, and many other plants that require a high temperature.

The small house has been used mostly as a propagating pit through the year. After the work of propagating had ceased, the stage on the west side of the house was planted with English forcing cucumbers, which will be grown during the summer months, mostly in the way of an experiment and to show the manner of cultivation of them.

VARIETY OF PLANTS.

In regard to the number of plants raised during the year for use in the houses and on the grounds, they are enumerated as follows:

Ageratum	1300
Alternanthera	2000
Achreanthes	300
Asters	2715
Carnations	540
Echevaria	1000
Lobelias	500
Geraniums	1000
Pansies	1200
Pyrenthum	1500
Petunias	100
Stocks	1400
Verbenas	800
Roses	100
Total	14,455

CAMPUS.

As usual, the campus has been cared for throughout the year, in the way of mowing and the making of improvements. At the commencement of the year all the earth that had been piled in a heap west and behind the Mechanical Hall was hauled and placed in the low places along the south boundary border of the campus. This earth had been removed from the foundation of the new heating and power plants, mostly for the purpose of constructing the cement floor of the plant. The raising of the said border has not yet been completed owing to the lack of soil, but as opportunity offers, the raising of the border will be continued, as it is very needful. Owing to the lowness of the land it is impossible to make shrubbery grow. A few trees have been planted during the year on that part of the border that has been completed.

To show the needs of the lower part of the campus several loads of manure have been spread on the surface of the grass, thus showing the great benefit some kind of fertilizer would be to the whole of the campus.

TILE DRAIN.

Two tile drains have been laid on the southeast quarter of the campus with latterals extending into the low wet places which has had the effect of changing the state of the ground very materially. These drains are in all nine hundred feet in length all told. A brick wall has been constructed at the mouth of each main drain in order to keep the bank of the open ditch from washing away.

The campus was harrowed and rolled during the early spring. This was done in order to get the surface more level. Owing to the lack of sufficient water duringt he Summer, quite a number of newly set trees died, but most of them were of cheap varieties and can soon be replaced.

LAWNS.

The lawns have been mowed as often as necessary during the year. The lawn east of Alpha Hall has received a liberal dressing of wood ashes, also that east of the Administration building. These ashes were gathered up from the various places in town and dormitories before they became leached out. The effect of the ashes upon the grass is very encouraging.

WALKS AND DRIVES.

During the month of July gravel was hauled from the river bottom and placed on the road west and back of the Agricultural Hall.

This was made essential owing to the road bed having sunk six or eight inches and after heavy rain the water collected which made it very disagreeable for the students passing to and from their classes. After the above work had been completed, the construction of a new gravel walk leading from Alpha Hall to Cauthorn Hall was commenced. The point of beginning was at the southwest corner of Alpha Hall ground. After the old board walk had been removed, the earth was removed to a depth of ten inches and six feet wide. After this was accomplished gravel was hauled in and placed six inches deep, the latter being well mixed with earth at the rate of one yard of the earth to two yards of gravel. This done, the whole surface received a coat of Oak Creek gravel as the latter binds much more than the Willamette river gravel and has a flat surface to walk upon owing to the rock not being round.

Two slit basins were placed in the walk between the Administration Building and Agricultural Hall, also one on the main walk near the main ditch.

The drive south of the Administration Building has received a coating of Oak Creek gravel for the purpose of raising the road so that the water might be turned towards the back of the building instead of washing the walk leading south of the Armory. All walks and drives have been weeded and edged, and in order to economize in labor, several hundred pounds of salt have been spread over the worst portion, the salt having done very successful work.

BEDS AND BORDERS.

Several new flower beds have been made during the year on various parts of the campus. Great pains have been taken in making the above in order that a better plant growth might be had. The said beds were dug up three feet deep and very rich manure and sandy loam mixed into the soil. In these beds have been set out portugal laurels, hollyhocks, sweet peas, roses and other bedding plants. Others have been planted to trees and shrubbery of several varieties.

CLASS WORK.

I have given instruction in floriculture during the Fall and middle terms. These have been given both practically and from textbook. The course in floriculture consisted of eighty-eight lectures. The course in landscape gardening consisted of fifty lectures.

These lectures were received by thirty and seven students respectively.

HORTICULTURE.

In addition to the work in floriculture and landscape gardening, owing to the lack of some one to teach the subject, I have met the class during the College year. The course of instruction in this department has been carried out as laid down in the catalogue for 1904, namely, propagation of various fruits and of methods and cross fertilization, and copious notes taken on all kinds of fruits in Station orchard. Total number of lectures given during the three terms have been 108. The total number of students each term has been six.

Respectfully submitted,

GEORGE COOTE.

MATHEMATICS AND ENGINEERING.

CORVALLIS, OREGON, July 18, 1905.

To the President:

SIR:—I have the honor to make the following report for the Department of Mathematics and Engineering for the year 1904-1905.

The year has been a very successful one, with the attendance very large, and with the students of an unusually good quality.

The total enrollment in our Mathematical and Engineering classes for the Fall, Winter and Spring terms was 346, 421 and 387, respectfully. Counting the attendance of a student at a single recitation as a unit, the total attendance for the year was about 63,725. The attendance average was also very high, being between 97 and 98 per cent. A large number of students had no absences for an entire term, while quite a number had none for the year.

Instructor Tartar has conducted the Sub-freshmen classes and the Freshman Commercial Arithmetic; Assistant Professor Johnson the Freshman classes in Algebra and Geometry, while I have had all other classes.

The following table shows more detailed information:

FALL TERM.

CLASS	SUBJECT	NO. SECTIONS	HRS. PER WEEK	NO. STUDENTS	TEACHER
Sub-freshmen	Arithmetic	2	10	65	Tartar
Freshman	Com. Arithmetic	1	5	36	"
"	Algebra	6	30	139	Johnson
Sophomore	Trigonometry	3	15	76	Skelton
Junior	Analytics	1	5	23	"
"	Mine Surveying	1	6	7	"
Total		14	71	346	

WINTER TERM.

CLASS	SUBJECT	NO. SECTIONS	HRS. PER WEEK	NO. STUDENTS	TEACHER
Sub-freshman	Algebra	4	20	132	Tartar
Freshman	Com. Arithmetic	1	5	41	"
"	Geometry	6	30	156	Johnson
Sophomore	College Algebra	2	10	57	Skelton
Junior	Calculus	1	5	25	"
"	Tunneling-Leveling	1	5	10	"
Total		15	75	421	

SPRING TERM.

CLASS	SUBJECT	NO. SECTIONS	HRS. PER WEEK	NO. STUDENTS	TEACHER
Sub-freshman	Algebra	4	20	95	Tartar
Freshman	Com. Arithmetic	1	5	33	"
"	Geometry	6	30	130	Johnson
Sophomore	College Algebra	2	10	54	Skelton
Junior	Calculus	1	5	28	"
Senior	Astronomy	1	5	13	"
Soph. and Junior	Surveying	1	9	34	"
Total		16	84	387	

Surveying is taught by what may be termed the laboratory method and every effort is put forth to make the work of as practical a nature as possible. We had no set classroom recitations, but the time was devoted to actual field work in the use and adjustments of the various instruments and their application to the practical problems of surveying. Problems were assigned in advance and methods of solution suggested and references given. The student was required to familiarize himself with these before going into the field, that the greatest amount of work might be accomplished in our limited time. For this purpose the student had access to various standard works on surveying as well as his regular class manual.

Much time was given to the testing and balancing of surveys and to computing areas. Besides the various exercises assigned the work included an elaborate farm survey. For this purpose the class was divided into five sections which worked independently. The agreement of these surveys was very close.

Great emphasis was placed upon the form and accuracy of the field notes. Each student was required to take full notes in the field in a prescribed note book. After these were carefully criticised and suggestions made, they were neatly copied into the student's "office copy" note book. Great interest and enthusiasm was manifested in this work, and I am pleased to note that many of the students have been enabled, through the experience acquired here, to obtain remunerative positions. In a supplementary report handed you herewith I call attention to some of the needs of the department.

A very large measure of the success noted is due to the able and faithful cooperation of Assistant Professor Johnson and Instructor Tartar.

Please accept, sir, my thanks for your consideration and cordial support.

GORDON V. SKELTON.

DEPARTMENT OF CHEMISTRY.

President Thomas M. Gatch, Oregon Agricultural College:

DEAR SIR:—I have the honor to present herewith a brief summary of the year's College work in Chemistry.

During the year Professor John Fulton has had charge of classroom and lecture work in general chemistry, also the organic chemistry for household science and agricultural students. He also had the classroom and laboratory work in mineralogy, geology, assaying and metallurgy. In addition to this, during the spring term he had two sections in physical geography.

Mr. C. M. McKellips has had entire charge of the pharmaceutical laboratories and also classroom and lecture work in all the purely pharmaceutical subjects. In addition to this, during the fall term he took charge of one class in advanced inorganic chemistry.

Mr. F. E. Edwards has had entire charge of the general and quantitative laboratories during the year. He also had charge of all classroom and lecture work in qualitative and quantitative chemistry, agricultural chemistry and organic chemistry for pharmacy students.

At the present time the teaching force is the same as it was seven years ago. Since that time the students in the chemical depart-

ment have increased about three fold. At present the teaching force is overburdened with class and laboratory work so that little time is left in which to prepare laboratory work or lecture experiments.

I give here verbatim a portion of the report of Associate Professor John Fulton. He says: "During the fall term I gave instruction in general chemistry three hours per week per section, excepting the first two weeks and also the last week of the term when I held classes daily to 116 students divided as follows:

	MEN.	WOMEN.	TOTAL.	GRAND TOTAL.
FIRST TERM CHEMISTRY I.				
Section A	34	23	57	
Section B	59	--	59	116
SECOND TERM CHEMISTRY II.				
Section A	47	2	49	
Section B	32	18	50	99
THIRD TERM CHEMISTRY XI.				
Section A	24	18	42	42

The fall term consisted of 13 weeks, requiring 6 hours per week, making 78 hours and 78 times 116 or 9048 student hours. The winter term consisted of 12 weeks, requiring 6 hours per week, making 72 hours and 72 times 99 or 7128 student hours. The spring term consisted of 11 weeks, requiring 3 hours per week, making 33 hours and 33 times 42 or 1386 student hours. Total number of student hours devoted to first-year chemistry was 17,562."

In addition to work in general chemistry Professor Fulton had charge of geology courses I-II-III, assaying courses I and II, mineralogy courses I and II, and physical geography two sections. This work was equivalent to 7630 student hours, making a total of 25,192 student hours for the College year just completed.

The following table gives a summary of the work done by Instructor F. E. Edwards during the past College year:

		Students	Hours per week	Weeks per term	Student hours
Fall term	Laboratory preparation		4	13	
Chemistry IVa	Agricultural chemistry	8	5	13	52
Chemistry XVIII	Quantitative analysis	14	10	13	1820
Chemistry I	General laboratory	117	4	13	6084
Winter term	Laboratory preparation		4	12	
Chemistry IVb	Agricultural chemtisry	11	7	12	924
Chemistry XVII	Organic chemistry	17	7	12	1328
Chemietry XIX	Pharmaceutical analysis	12	10	12	1440
Chemistry II	General laboratory	98	4	12	4404
Spring term	Laboratory preparation		4	11	
Chemistry V	Quantitative analysis	21	10	11	2310
Chemistry III	Qualitative analysis	46	4	11	2024
Chemistry XV	Qualitative analysis	40	10	11	4400
	Extra section III and XV		6	11	
Chemistry XX	Pharmaceutical analysis	11	10	11	1210
Totals	Fall term	139	23	13	8424
	Winter term	138	32	12	8096
	Spring term	118	44	11	9949
	For year	395		36	26,464
	Women	66			
	Men	329			

Instructor C. M. McKellips, who has entire charge of all pharmaceutical work, and whose laboratory facilities are entirely inadequate, devoted approximately the same number of student hours to his work as did Instructor Edwards to students in chemistry.

To one who is familiar with College work, I think it is easy to realize that the amount of work required is too much for the present teaching force. The spring term schedule shows that Instructor Edwards had 40 hours instructing per week. This means *every class-period in the week*, which is too much.

I would venture to suggest that when more help is obtained for the department that a man versed in chemistry and especially in pharmaceutical subjects be obtained. If this is done, then a course leading to the degree graduate in pharmacy could be established. This is desired very much by druggists of the state.

The department is fast outgrowing its present quarters. Chemistry courses IV—IV a and XVII which should consist of both recitations and laboratory work were confined to recitations principally. This was especially true of course XVII which is organic chemistry. This requires laboratory work but none could be given owing to a lack of room. Our general laboratory, which is probably the largest and best in the Northwest Pacific region is not large enough to accommodate the rapidly growing sophomore classes in chemistry. There is desk room for 96 students. During the fall term of the year just closed the beginning course registered 120, and during the winter term 98 students. In the spring term there were 86 students in qualitative analysis and 11 in pharmaceutical analysis, making 97 for the laboratory. From this it will be seen that the laboratory was over run each term of the year.

2nd. The shelf space in the chemical storeroom is not adequate to hold all the apparatus and chemicals that it is necessary to store there for use in the laboratories during the year.

3rd. The quantitative laboratory is badly in need of hoods to carry away acid vapors and offensive gases; also suitable cases for quantitative apparatus in daily use. The balance room is badly in need of suitable cases and supports for the analytical balances, and case for reference books and apparatus. This laboratory is also too small for the classes that should be accommodated in it. During the spring term the class in pharmaceutical analysis had to work in the qualitative laboratory, which was not fitted for that kind of work.

4th. There is also a pressing need for an organic laboratory. During the winter term, the laboratory work for the class in organic chemistry was done on the lecture table by the instructor with one or two members of the class as aids. The southwest corner room on the third floor of the building would probably accommodate this class of work if it were fitted out with desks. This laboratory could also probably be used for agricultural chemistry.

I wish also to call your attention to the fact that the pharmaceutical department has entirely outgrown its present quarters.

The work in mining and assaying has grown to such an extent that Professor Fulton feels the needs of two more furnaces in the assay laboratory.

The foregoing facts calling attention to the condition of the departments of chemistry, pharmacy and mining are not given in a fault-finding way, but to show how the departments are growing. The growth of the departments during the past year has been most healthy and the work accomplished most gratifying. This has been very largely due to the painstaking and faithful work done by Professor Fulton and Instructors McKellips and Edwards.

Before closing permit me to call your attention to the condition of the Departments of Chemistry and Pharmacy and of Mining as shown by the invoice which has just been completed (July 6, '05):

Fixtures and permanent equipment	$2,325.00
Apparatus	4,940.00
Chemicals	1,000.00
Total	$8,265.00

The foregoing report is respectfully submitted.

A. L. KNISELY, Professor of Chemistry.

DEPARTMENT OF BACTERIOLOGY.

CORVALLIS, OREGON, June 21, 1905.

President Thos. M. Gatch:

DEAR SIR:—I herewith submit a report of class work done in bacteriology during the past school year ending June 14, 1905.

In accordance with the catalogue schedule, a class of students consisting of seniors from the pharmacy course, electives and post graduates, have been taught the underlying principles of the art and science of bacteriology.

These students have been faithful and energetic in doing good solid work, by which they have gained a practical knowledge of the subject. The work consisted of either recitations, or laboratory practice, one period each day for three terms.

Seven students wrote their graduation theses, which were very creditable, from data obtained in their laboratory research work.

The importance of this modern science is better understood, when we recognize the fact that bacteria play such an important role in our every day lives, both in disease and in the economy of nature, that a student who is equipped with a knowledge of pathogenic varieties of organisms, their control by disinfectants and sanitation, is better fitted for life's duty, than those who do not possess it. An understanding of the relation of micro-organisms to agriculture and dairying is so rapidly being developed and utilized, that we are forced to realize the fact that nearly all plant food, physiological and chemical transformations in milk and its products, diseases of plants and animals, are due to the activities of bacteria and their products under certain conditions, so that the inestimable value of a knowledge of this science to the coming generations, appeals to its encouragement and dissemination.

The teaching has in no way interfered with my Station duties, but on the contrary, much valuable aid has been rendered by the students.

Respectfully submitted,

E. F. PERNOT.

DEPARTMENT OF MUSIC AND MODERN LANGUAGES.

CORVALLIS, OREGON, June 24, 1905.

To the President of the Oregon Agricultural College:

DEAR SIR:—During the school year 1904-1905 there have been ninety-one (91) students in the Department of German. Of these 65 were in the first year, and 26 in the second year of the course. The first class has been divided and taught in two sections, partly on account of the large number of students, partly to avoid conflicts.

Generally speaking, I have followed the same course that Miss Chamberlain taught, using the same text-books in the first year's course, but in the second year I deemed a change advisable.

As the course in this College covers only two years, and as it is impossible within such a short time to learn to appreciate beauty

of language in poetical works, and as moreover the aim of this College is to give a practical knowledge, I have used in the second year's course more prose and less poetical works, which are of more practical value.

As German is the only modern language that is in the curriculum, and as there seemed a slight demand for French, I started in December a private French class of nine. The lessons were given after school hours, and the class continued until the close of the school year.

In the Department of Piano I have had 34 private pupils, the majority of whom continued until the end of the Spring term. One piano pupil graduated. I am following here the same standard that I followed during the 17 years that I taught in Boston, Mass. The standard is a high one, and will compare favorably with that of any music school in the country.

During the school year I had three pupils' recitals, and have also given three piano lecture recitals myself.

I have had a small class in Musical History with two lessons weekly, and another class in harmony with two lessons throughout the school year. During the Spring term musical theory and counterpoint was also taught.

Being requested to do so, I also took charge of the College Glee Club, although this does not properly belong to the piano department.

I also trained a chorus of over 60 voices for a cantata. This cantata, together with several oratorio numbers were rendered on June 2nd in the Opera House for the benefit of the Y. M. C. A. building fund.

Respectfully submitted,

GERARD TAILLANDIER.

DEPARTMENT OF FREEHAND DRAWING.

The work of this department has not differed essentially from that of the two previous years. The most marked innovation has been the substitution of the pencil for charcoal as a drawing medium. As students cannot well make scientific or working drawings with so clumsy an instrument as charcoal, it was deemed wiser to discard the more artistic medium for the more simple and convenient pencil or pen. As the O. A. C. is chiefly a technical school the

instruction in drawing does not attempt to follow the lines of an art school. Accuracy of outline and truth of detail are emphasized as of more value to the mechanic or scientist than a general artistic sense of form and color.

Space and equipment were sufficient to meet the demands and with the exception of a few models for still-life, no changes or additions were made in the drawing room.

The special classes were given temporary quarters in a room formerly used for photographic purposes, the character of work necessitating better light and more space. There they enjoyed freedom from interruption and excellent facilities for work.

The number of students enrolled for the year ending June 14, 1905, is as follows:

FREEHAND DRAWING.

First term.—Pharmacy course		23
	Agricultural course	30
	Mechanical and Mining	78
	Household Science	34
Second term.—Pharmacy course		34
	Agricultural course	39
	Mechanical and Mining	92
	Household Science	34
Third term.—Agricultural course		25
	Mechanical and Mining	89
	Household Science	25
		485
Special classes.—Life Sketch class		16
	Water Color class	9
	Black and White class	5
Total		515

AMMEE LEVERETT, Instructor.

DEPARTMENT OF HISTORY AND LATIN.

President Thos. M. Gatch, Oregon Agricultural College:

Dear Sir:—I report the following:

Instructors in History.—J. B. Horner, A. M., Professor; W. T. Shaw, M. S., Instructor; Thos. Bilyeu, B. S., Instructor.

Courses in History.—I. History of Greece and Rome; II. Mediæval History; III. History of Eastern Peoples; IV. Modern History; A. U. S. History—Discovery of America to Civil War; B. U. S. History—Civil War to present time.

Class Work.—I. Class recitation from text-book (Myers); II. Supplemental work from library; III. Lectures on the more important periods and events; IV. Drawing maps in the text book to locate the historical events and retain the subject matter easier; V. Spelling tests of proper names and difficult words found in the lesson; VI. In each course the student is required to prepare and read at least one paper on some character or event studied during the term; VII. Attention to Mythology, customs and literature touching events studied; VIII. Developing a tendency on the part of students to introduce more history into their society work, their debates, essays and junior orations.

Miscellaneous.—There were from 150 to 200 students in history each term last year.

Should the school year be divided into semesters, it would be advisable to adopt the simpler classification of general history into ancient and modern. Many colleges have already made this classification, and for the sake of uniformity, it may be better for us to make the classification in the near future.

Last year's students in history have at the present time some class-work on exhibition in the Oregon Agricultural College Department of the Lewis and Clark Fair.

The study of history leads young people to become omniverous readers, and eventually to cherish the nobler deeds that have made good men and women famous. It inclines girls to emulate the greatest women in those higher virtues and graces that exalt womanhood; and in devious ways it leads boys to become chivalrous, genteel and patriotic, until they learn to frown upon vicious criticisms and evil tendencies that threaten the sanctity of the home and the progress of good government. While history, therefore, enriches the mind and helps to determine the career of young people, a fair knowledge of the subject is absolutely essential to American citizenship with its accumulating responsibilities. Consequently, I would deplore as a calamity any effort to crowd out from our colleges this vastly important subject with substitutions that are magnified on account of the commercialism they offer. Let us have more history and as a result better citizenship to strengthen American men and women and fortify them in the faith they hold in our institutions at a time when the oncoming tide is bringing from every shore an increasing multitude of foreigners, many of whom are steeped and dyed in the venom of dangerous anarchism

because they have never known how much history was necessary to make the American Government possible.

LATIN.—Six courses in Latin are offered in the Oregon Agricultural College. Only the first three courses are required, and those only in pharmacy. However, sixty percent. of those in language last term were in the Latin classes. Owing to the fact that the last three courses in Latin are elective, some difficulty was experienced last year in finding an hour when the students in the advanced class could all be accommodated without conflict in recitations; so the class recited at 7:15 a. m., the most of the time.

In Latin as in History, I find two grades of students: One grade that have learned how to study, possibly in high school or college. These young people find the subject comparatively easy. Another grade—many of whom, register from some public school where the training in English grammar may have been meager—have to do extra work to keep along with their classes. But as a rule, they soon develop a taste for the subject and increase their zeal for English grammar as well as for language in general.

COURSES IN LATIN.—The courses in Latin are as follows:

Courses I, II, III—Collar and Daniell's "First Year Latin" and first thirty chapters in Caesar.

Course IV—Caesar—Remainder of Book I, also Book II; Allen and Greenough's grammar.

Course V—Cicero's Orations.

Course VI—Aeneid—Collar and Daniell.

Respectfully submitted,

JOHN B. HORNER.

LIBRARIAN'S REPORT.

President Thos. M. Gatch, Oregon Agricultural College:

DEAR SIR:—The College has purchased during the year one hundred and seventy-nine bound volumes of books, costing two hundred and thirteen dollars and twenty-nine cents, which have been labeled, recorded and indexed.

The Encyclopedia Americana comprising sixteen volumes is one of the valuable accessions.

From all other sources there have been received about two-hundred bound volumes more.

Forty monthly and twenty-five weekly publications have been taken by subscription.

More weeklies than ever before have been sent gratuitously to the reading room.

An annex which was fitted up the first part of the year has added very much to the capacity and convenience of the library, besides serving well for a recitation room and a meeting place for one of the societies.

The amount of reading and research done emphasizes the value, in College work, of a large and well selected collection of books.

Many needed works have been called for which the library does not contain.

The average number of books daily drawn has been about twenty-six.

A catalogue of the library was issued during the year.

A locker case which works very satisfactorily has been supplied for the preservation of the periodicals.

Respectfully submitted,

R. J. NICHOLS, Librarian.

MILITARY SCIENCE AND TACTICS.

President Thos. M. Gatch, Oregon Agricultural College:

DEAR SIR:—I have the honor to submit the following report of the Military Department of this College for the year ending June 30, 1905.

My predecessor, Major C. B. Hardin, 20th Infantry, had left about a month previous to my arrival here October 3, 1904.

When I entered upon my duties about fifteen days after the commencement of the school year, I found instruction seriously retarded by the system in vogue of selecting all officers from the senior class; this left the organization at the beginning of each year without experienced instructors to teach the new cadets, about two hundred of whom entered at the beginning of this year. As a result much valuable time was lost to them while the new officers were being instructed in their duties. The officers at present are selected from the senior and junior classes; this will give the organization a set of experienced officers each year.

Much discontent was noticeable on the part of those cadets who had drilled two or three years as Infantry. I removed the possibility of future discontent in this connection by forming detachments of Cavalry, Artillery, Signal Corps, Hospital Corps and Topographical, Surveying and Sketching Section. The two former are composed of those cadets who have drilled at least two years as Infantry and were able to pass a satisfactory examination in that subject. The cadets forming the Hospital Corps are selected for their adaptability to that kind of work and give instruction in first aid to the injured to the entire regiment. The Signal Corps is composed of those cadets physically unable to drill for any length of time with a rifle. The Engineer Corps (Topographical section) is selected from those cadets who have drilled at least two years as Infantry and possess a knowledge of the use of transit, Y levels, plane tables, etc. Time spent on this work in the Surveying Department is also credited to them in the Military Department. All these detachments I have formed into a separate battalion, and as a reward of merit, Infantry cadets proficient in Infantry drill and having drilled at least five terms may take instruction two days per week in any one of the detachments.

A retired sergeant of Infantry, U. S. A., has been employed as armorer. The arms and other Government property are at present in excellent condition and as the armorer has been placed exclusively under the Commandant of Cadets, the latter alone will be at fault if proper care is not taken of all Government and College property in the Military Department.

From the active support given me by every official of this institution it seems to be the desire of all concerned to place it in that class where at least a graduate a year may be selected for appointment as Second Lieutenant in the regular army, and in this connection I would state here that the commendable zeal displayed by the officials and the cadets of the College will in a short time bring about this much desired result, as I do not think there is a military body west of the Mississippi more proficient in Military Science and Tactics.

All orders and instructions from the War Department have been complied with to the letter since my arrival here, although in receipt of authority from the War Department to forego target practice this year, I was able to give Sighting, Position and Aiming Drill, Estimating Distance Drill and Gallery Practice to the graduating class.

It is to be regretted that circumstances prevented the immediate use of the $15,000 appropriated for the construction of the Armory and Drill Shed, the erection of which would entirely remove a cause which has in the past retarded intelligent instruction.

Every effort should be made to induce the State authorities to erect the State Target Range in this vicinity. The Adjutant General of the State is favorable to the idea, which is half the fight.

The necessity for a change in uniform is so apparent that I hardly need mention it here, but will invite attention to a few defects in the blue uniform which are supplied in the olive drab.

BLUE.	OLIVE DRAB.
Blouse—No outside pocket.	*Blouse*—Four outside pockets.
Blouse—One inside pocket, continual use of which destroys tape on the blouse.	*Blouse*—No inside pocket.
Collar—Straight with tape, necessitates white standup collar.	*Collar*—Rolled, wear any kind of shirt or collar and look neat.
Headgear—Too small, no air space, does not protect the eyes, on contrary, reflects the sun.	*Headgear*—Cap with large curved visor, soft top. Campaign hat.
Trousers—Become threaded easily, require constant creasing, impossible to wear leggings for any length of time.	*Trousers*—Can be used for 2 or 3 years without showing wear, 1-10 as much creasing as with blue. Knee breeches can be used with leggings and do not need creasing.
Pockets—When inside pocket is overstocked, congests the chest.	*Pockets*—Outside. Chest of blouse full 3½ inches.
Cost—Complete, $19 to $29.	*Cost*—Complete, at present, $17.50. Possibility of securing it for $15.50 next year.
Made in Ohio, 3 to 4 months needed for delivery.	Made on Pacific Coast, 1 month to 45 days.
hree or four different grades of material made by jobbers.	One grade, Government tested, tailor-made.

Comparison between the two uniforms as to durability and appearance is overwhelmingly in favor of the olive drab.

Since my arrival here in October the military body has been using the new Drill Regulations, a fact which will make us the winners of the Lewis & Clark trophies.

The following is a summary by term of the average attendance and the number of hours per week in both theoretical and practical instruction:

First Term, 12 weeks, 395 cadets; Practical Instruction 6 hours per week; Theoretical 41-4 hours. Second Term, 11 weeks, 371 cadets; Practical Instruction 6 hours per week; Theoretical 1 hour. Third

Term, 9 weeks, 338 cadets; Practical Instruction 5 hours per week; Theoretical 1 hour.

Maximum number of students in Department during year..... 441
Minimum number of students in Department during year..... 338
Graduates from Military Department this year 34

As the names of those graduates who received special mention are contained in the Catalog recently prepared, I will not repeat them here.

During the year the following prizes were given for proficiency:

Three olive drab uniforms of regulation make were donated by Messrs. J. M. Litchfield & Co., No. 12 Post street, San Francisco, Cal. After competition drills and examinations in military science they were awarded to Sergeant K. L. Cooper, Corporal C. V. Brownell and Trumpeter A. C. Van Cleve. One pair diamond set cuff links, given by Dr. D. Mathews, won by Sergeant Ray Walker. One gold medal, donated by Mr. W. D. DeVarney and other citizens of Corvallis, awarded to Lieutenant Colonel T. A. Garrow by regular army judges at Lewis & Clark Exposition. One gold medal, donated and awarded as in the previous case, to 1st Sergeant P. Gearhart, but to be drilled for again next year.

Among other vigorous efforts made by me to modify the hours of instruction required by the War Department, so they would not conflict with instruction in other departments. I invite attention to the following copy sent (No. 9 of February 13, 1905) from the Headquarters of this department:

"*The Military Secretary, Washington, D. C:*

SIR:—I have the honor to submit the following recommendations as to the minimum amount of time I consider reasonable for the theoretical and practical instruction in the military body of this institution.

(1) That the military body be instructed five days per week.

(2) That a period of not less than fifty minutes daily, actually devoted to this instruction.

(3) That on certain occasions with the permission of the President of the Faculty, the Commandant may utilize the entire week's time of 250 minutes in any one or two days. (Time necessary in case of marches, solution of problems, range practice, etc.)

(4) The week's instruction to include one ceremony and three Guard Mounts. (Guard Mount so arranged that every member of the military body shall be mounted as guard at least twice a month.)

At this institution the cadet officers of the military body are selected from the senior and junior classes, so either class can be assembled for instruction in Military Science without retarding practical instruction.

Every member of the military body of this institution is supplied with a

copy of the new Infantry Drill Regulations and the Manual of Guard Duty; as a consequence since the first term I find it unnecessary to hold officers' and non-commissioned officers' school regularly.

On my arrival here last October I found most of the time allotted for practical instruction spent in giving theoretical instruction on the drill ground to the officers and non-commissioned officers. Since all have been supplied with Manuals practical instruction has not been hampered. The drill for the following day having been prescribed in advance with these Manuals and ten minutes study, the cadet is at present doing better work in thirty minutes than he did in two hours in the first term without Manuals. For the above reason I consider the time recommended as sufficient.

Very respectfully,

DENNIS P. QUINLAN, 1st Lieut. 5th Cavalry.,
Professor Military Science and Tactics."

Shortly after sending the previous recommendation, I received the following:

"GENERAL ORDERS, No. 57. WAR DEP'T, WASH., APRIL 7, 1905.

At every institution of Class B, at which a Professor of Military Science and Tactics is detailed, it shall be provided in its regular schedule and studies that at least three hours per week for two years or the equivalent thereof, shall be assigned for instruction in the Military Department, not less than 2-3 of the total time to be devoted to practical drill including Guard Mounting and other military ceremonies, and the remainder to theoretical instruction.

By order of the Secretary of War,

Official: F. C. AINSWORTH, ADNA R. CHAFFEE,
The Military Secretary. Lieut. Gen., Chief of Staff."

This order demands less time than my recommendation called for and I firmly believe that it is to the best interests of the College to follow the lines laid down in my recommendation rather than avail itself of the provisions of General Order, No. 57, quoted above. The short difference in time between that contained in my recommendation and that required by the War Department could be used as a buffer against a possible violation of War Department orders and at the same time give some discretionary power to the Commandant, for in emergencies it is often necessary to excuse different cadets for three or four days a month. It can be easily seen that the average time spent on drill would be about the time granted in General Orders, No. 57. That you have already authorized me to continue on these lines is not only a matter of extreme gratification to myself but has been of great benefit to all departments, and I hope that it may be continued in future. In connection with this, I would state that I am a firm believer in athletics; they are now

recognized as a part of the military instruction in the regular army and if last year's averages of the athletes in their military studies is a criterion, I am in favor of devoting part of the time allotted to the Military Department to athletic exercises and will assist in every way to the best of my ability. It is my earnest desire that military instruction shall not conflict in any way with instruction in other departments, but work hand in hand for the best interests of the cadets and the entire institution.

Capt. Frank L. Winn, 12th U. S. Infantry, as special Inspector detailed to inspect the Military Colleges in the Pacific Division, inspected us on May 19th, from about 7:00 a. m. until 5 p. m., and from what I can learn gave the most thorough inspection ever held at this College and exceeded by three hours any inspection made at other colleges during his tour. While his report has not been received yet I know from his remarks to me and from those made to officers at colleges subsequently inspected that the result will be gratifying to all concerned. He had us drill in everything prescribed in the practical course; critically examined the essays on military subjects submitted by the seniors and thoroughly questioned all officers.

The property in the hands of the Military Department is in excellent condition, only a few minor articles being short, these the Inspector suggested be supplied, but I would suggest waiting until we learn the decision of the War Department in regard to the substitution of modern arms for those at present in use. This will save a freight account both ways.

The Band has been supplied with some much needed and excellent instruments, also a supply of music. Mainly under the instruction of an older and experienced leader for the last two months, the band has been placed in the way of becoming the best college band in the west. At this point, I beg leave to recommend that a competent leader, who could act as instructor in another department or of band and reed music, be permanently employed. A cadet leader is a nuisance and out of place in a college of this size. Should I be so fortunate as to be Professor of Military Science and Tactics next year, with your permission the Band will receive a thorough disciplinary drill before being allowed to practice as musicians.

The regiment participated in various parades during the year, particularly on Decoration Day, and at the opening exercises of the

Lewis & Clark Exposition on June 1st; in the latter event 324 cadets under my personal command participated, and outside the regular cavalry we were the only organization which marched into the Exposition grounds with the same number with which we started. The cadets presented a fine appearance and I take great pleasure in quoting a portion of President Goode's letter to me.

"The appearance of the O. A. C. cadets was excellent and a matter of keen gratification to the people of the State."

On June 15th about 300 cadets went into camp at the Lewis & Clark Exposition grounds. During our stay of seven days the following ceremonies were held.

Guard mounting every morning at 9:00 o'clock. On the afternoon of the 19th President Goode reviewed the regiment. On the 21st the competitive drill for Exposition trophies with regular army judges was held; this consisted of first, a review of the entire regiment; second, a battalion drill followed by two company drills and ending with a guard mount. All officers witnessing the drills pronounced them as the finest exhibition they had witnessed from one organization; one of the companies making 84⅓ per cent. This is equal to the percentage made by Infantry companies in the regular army. I have no fear but that the result will bring all the trophies to this College.

The food served while in camp was wholesome and the same as that of the regular army and National Guard and was prepared by regular army cooks. My desire was to give the cadets a good, legitimate time at as little expense to the cadet and the College as possible, and all my efforts was toward this end.

An encampment and Exposition coming together to most of the cadets was bewildering, and to have charge of them at such a time was a severe strain on one man. The officials of the Fair and the officers of the Exposition Guard in particular, congratulated me on the behavior of the regiment, not a member getting in trouble of any kind. They at all times looked neat, were gentlemanly and the complete absence of profanity was noticeable.

I wish to make the following recommendations:—That a communication be sent to the War Department requesting that the Krag-Jorgenson cal. 30 carbine be substituted for the cal. 45 Springfield cadet rifle at present in use. That one Gatling gun and one 3.2-inch B. L. field piece be substituted for the artillery pieces at resent in use here. In addition to this I would further request

that the College be supplied with the following:—One packing outfit, complete; two telegraph instruments; two heliographs, complete; three sketching cases; ten cavalry saddles, bridles, blankets, halters and sufficient haversacks, canteens, knives, forks, spoons and tin cups for 400 cadets. Also five cal. 38 or 45 pistols with sufficient allowance of ammunition, and 40 copies of Field Service Regulations. In recommending that these articles be applied for, I believe it will prove to be an economical and educational investment, for if the proper instruction is to be given in the military art it is necessary to have model and modern implements and equipments and the majority of these can not be secured from any other source than the War Department. The majority of the above was included in my recommendations to the Inspector General and I feel that in time we will be able to secure the carbines and rapid fire guns. I am very anxious to instruct the juniors and seniors next year in Bitting and Bridling, proper care of the horse and the treatment of ailments common to this animal. This I think, every graduate from an agricultural college should know and as I am a cavalry officer this instruction will be a pleasure to me. Again the packing outfit requested is a valuable adjunct to a college of this kind, as our engineering graduates in following their profession will find that a knowledge of how to properly pack a horse will be worth thousands of dollars to them.

Adding to this a proper knowledge of the Sketching cases, future instruction in the military department of the O. A. C., will be more valuable to the cadets than it has ever been in the past. I would state that this College is the only one to my knowledge which contemplates these diversions.

In conclusion, President Gatch, should matters so arrange themselves that I unfortunately cannot be the Military Instructor here next year, I wish once again to acknowledge the unfailing courtesy you have extended to me personally, and the active assistance which you gave me at all times in the performance of my official duties. If I have had any success in my department, it was made possible by your advice and assistance, the Inspector himself remarking that after conversing with you he had located the main cause of my success here. Very respectfully,

DENNIS P. QUINLAN, 1st. Lieut. 5th Cavalry,
Professor of Military Science and Tactics
and Commandent of Cadets.

REPORT OF DIRECTOR.

President Thomas M. Gatch,

Dear Sir:—I herewith submit the annual report of the Experiment Station for the year ending July 1, 1905, including the reports of the departments of Agriculture, Chemistry, Entomology and Bacteriology.

The endeavors of the Station have been directed along the same general lines which have characterized the work for several years past. Routine work, however, has consumed a larger proportion of the time during the past year in some of the departments than usual, especially in the department of Chemistry. There is a growing demand from farmers and others for the analysis of soils and other natural products of the state. Many of these requests for analyses are of strictly local interest, while others are more general in their character and frequently relate to substances that may ultimately become the basis of important industries. Much of this work may be classed as of interest only to the party making the request for the analysis and yet in the aggregate it has an important bearing on the development of the various resources of the state. It is plainly apparent that if the Station undertakes to analyze all of the soils and other articles presented, more assistance must be furnished to the chemical department. This work at present has assumed such proportions as to seriously interfere with the research work of the department.

The department of chemistry is conducting an extensive investigation of the hop industry, including the evaporation of the hop under moderate temperature so as to conserve the maximum amount of lupulin and the food habits of the plant In addition to this the effects of various cultural methods and crop rotations on soils are carefully studied, all of which are of great economic value to the agricultural interests of the state.

The various agricultural evolutions of recent years have steadily made inroads on the time of the Entomologist. To this department the investigation of all plant diseases have been assigned, with the result that practically the whole time of the department during the growing season is taken up in field investigations of some new insect or fungous pests, and in answering inquiries for methods of control of some outbreaks of disease or attack upon the crops of the field, garden and orchard.

Valuable cooperative work with local orchardists and the department is being conducted with the use of various spraying mixtures for the control of anthracnose, scab, codling moth and San Jose scale.

The department of Bacteriology is making substantial progress and is becoming of material economic value to agricultural interests. In addition to considerable routine work in the investigation of diseases of poultry and other domestic live stock, much valuable research work has been done by the department in the canning of cheese, preserving butter and the canning of fruit and vegetables by a new method of comparatively low temperature, which at present promises to be a marked improvement over older systems.

Horticultural work is practically nil. Aside from the excellent cultural work in the Station orchard, provided for by the department of Floriculture, there is nothing being done by the Station in systematic and practical horticulture. The Station suffers a serious embarrassment for the want of a scientific and practical horticulturist. This industry which brings to the people of the state several millions of dollars revenue annually is practically unrepresented at the Station. This State presents a large field for the development of horticultural interests. The Station is constantly beseiged for information on various phases of the industry, especially on nut culture, which industry is destined to assume large proportions in the near future. The present widespread interest in the growing of the commercial walnut is liable to lead many into serious mistakes and result in financial disaster. The subject should receive competent investigation and the people be intelligently advised as to the character of soil, varieties and cultural methods best suited to conditions found here.

The Station has secured during the past two seasons valuable data regarding irrigation in Klamath county. These data are very useful in supplying information to other parts of the State. It may seem paradoxical to suggest that this Station undertake experiments in irrigation on the College farm. There is evidently a large and profitable field for irrigation awaiting development in Western Oregon. Growth with uncultivated crops practically ceases during the months of July, August and September, while if these crops were supplied with sufficient moisture at this time, these months should be as good a period for crops as any time during the growing season. The Station could perhaps lease the water

privileges of Oak Creek for five years at nominal cost. Thus a gravity system of irrigation could be established to determine the value of irrigation for various crops during the dry season. In case water privileges cannot be secured a pumping system at somewhat greater expense could be established on the College farm.

GENERAL AGRICULTURE.

The endeavors of the agricultural department were largely devoted to rotation systems of cropping, soiling dairy cows, and alfalfa investigations. For several seasons the Station has secured gratifying results from two general systems of crop rotation; a four year rotation with corn, wheat and two years of clover, and an alternating system with vetch and spring grain.

For the past three seasons the Station has conducted investigations as to the feasibility of soiling dairy cows with the result that in 1903 two acres of alfalfa and one acre of crimson clover yielded 95,744 pounds of green forage, or sufficient to feed 10 cows for 127 days. In 1904 two acres of alfalfa and two acres of vetch and winter rye yielded 79,685 pounds of green feed, or sufficient to maintain 10 dairy cows 106 days. In addition the two acres of vetch yielded a second crop of 15 bushels of seed. This year two acres of alfalfa, one acre of vetch and rye and four-fifths of an acre of vetch and winter oats yielded 107,870 pounds of green forage, or sufficient to maintain 10 cows for 143 days. The two acres of alfalfa will yield one and probably two more light cuttings this season. An acre of this land would scarcely furnish sufficient pasturage for one cow for four months. Thus it will be seen that soiling is economy of land.

INVESTIGATIONS OF FORAGE PLANTS.

Considerable attention has been given to alfalfa and from results obtained thus far it is evident that this forage plant can be successfully grown on large areas of land in the Western portion of the State. Experiments are under way with the use of lime at the rate of one ton per acre; also with treated seed by means of cultures of bacteria secured from the National Department of Agriculture as against the use of impregnated soil.

The Station has supplied during the past year 4,400 pounds of inoculated soil to 21 farmers and has sent out 3 packages of treated seed for cooperative work.

For several years an effort has been made to find a good pasture

grass, one that would afford some growth during the dry season. It is found by experiment that the grasses known as Oregon evergreen and Festuca arundinacea are both well adapted to the heavy clay soils of this section and promise to be excellent pasture grasses.

Work in the selection of vetch with a high protein content is continued, also with the testing of new varieties of forage plants.

ANIMAL HUSBANDRY.

In addition to soiling experiments with dairy cows and young stock, two digestion experiments were conducted with four animals with vetch hay and corn silage. The results of this work were published in Bulletin 85.

Two feeding experiments were conducted with swine. Ten shotes of the same age and breed were divided into two lots. Lot 1 was fed ground wheat and consumed in 76 days 2,457 pounds, gained 515 pounds. Grain consumed for one pound gain in live weight, 4.77 pounds. Lot 2 was fed ground barley and consumed in 76 days 2,527 pounds, gained 505 pounds. Grain consumed for one pound gain in live weight, 5 pounds. Thus it will be noted in this instance that barley, a much less expensive feed than wheat, gave nearly as good results as wheat.

MISCELLANEOUS INVESTIGATIONS.

This includes investigations with corn, clover and vetch silage, both steamed and unsteamed, variety tests of various cereals and forage plants; systems of rotation and cultural methods.

FARMERS' INSTITUTES.

The Station Staff has conducted during the past year, 18 institutes with an aggregate attendance of about 5,500 persons. Individual members of the Staff have also assisted in a number of State and National conventions and local agricultural and horticultural meetings.

Five bulletins were issued during the year:—No. 82, "The Apple in Oregon"; No. 83, "The Perpetuation of Pure Cultures for Butter Starters"; No. 84, "Poultry Under Confinement"; No. 85, "Digestibility of Vetch Hay and Corn Silage"; No. 86, "Cooperative Irrigation Investigations with the Office of Experiment Stations, United States Department of Agriculture."

Receipts from sales of farm commodities, live stock and dairy products, $1350.26. Respectfully submitted,

JAMES WITHYCOMBE.

REPORT OF CHEMIST.

CORVALLIS, OREGON, July 5, 1905.

Dr. James Withycombe, Director Oregon Experiment Station:

SIR:—I have the honor to submit herewith a resume of the work of the department of Experiment Station chemistry for the year ending June 30, 1905. Some lines of work are being carried on conjointly with other departments of the Experiment Station and have been under way for several years. The work of the chemical department includes the following:

1. A continuation of the study of steamed silage.
2. Crop rotations and their effects upon the soil.
3. The effects of summer-follow.
4. Experiments in fruit and vegetable drying.
5. Experiments in the drying and composition of hops.
6. The availability of plant food in the soil.
7. Acid soils in Oregon.
8. The effects of fertilizers on prune trees.
9. A study of protein in vetch hay.
10. Digestibility of vetch hay and corn silage.—(See Bulletin 85.)
11. Analyses of soils from old apple orchards.
12. Chemical work required in analyzing waters used in irrigation experiments in Southern Oregon.—(See Bulletin 86.)
13. Study of fertilizing value of waste products from various canneries and manufacturing establishments in the State.
14. The effects of the use of lime in the straw heap.
15. The action of lime and potash salts on Willamette Valley soils.
16. Miscellaneous work includes analyses of soils and waters; insecticides such as Paris green, London purple and white arsenic, also samples of cider and vinegar. A number of samples of concentrated feeding stuff were examined in order to ascertain their value. Samples of fertilizers were examined for plant food value, etc.

I. STEAMED SILAGE.

This work has been under way since 1901. During this time one bulletin (No. 72) has been published upon the subject. Each year both large and small silos have been filled with various green crops such as corn fodder, clover, vetch and grasses. Some of the silos have been filled without treatment, others have been steamed during the process of filling.

Thus far it would seem that corn fodder was the crop best adapted to steaming in the silo since the fermentation in the fodder seems to be more easily checked than in the grasses. The Station has met with one or two failures in the steaming process because the silos were not properly steamed but on the whole the work has been successful and is encouraging.

Since the changes which take place in the silo are measured largely by an increase in acidity, the following table will be of interest:

Lab. No.	Total Acidity Calculated as Acetic Acid in Composite Sample.	When Put in Silo.	When taken Out of Silo.	
		Per cent.	Lab. No.	Per cent.
1936	Cut corn fodder, large silo, not steamed		(1936)	1.94
2080	Cut corn fodder, small silo No. 4, not steamed	0.12	(2289)	1 78
2373	Cut clover, small silo No. 2, not steamed	0.18		1.01
2080	Cut corn fodder, small silo No. 1, steamed	0 12	(2291)	.35
2080	Cut corn fodder, small silo No. 5, steamed	0.12	(2263)	.30
2359	Whole clover, large silo No. 2, steamed	0.18		.52
2360	Cut clover, large silo No. 3, steamed	0.18		.71
2374	Cut vetch, large silo No. 1, steamed	0.27		.88
2366	Cut clover, small silo No. 5, steamed	0.24		.42
2373	Cut clover, small silo No. 1, steamed	0.18		.44
2429	Cut corn fodder, large silo No. 2, steamed	0.18		.48
2628	Cut corn fodder, large silo No. 1, steamed	0.12		.73
2628	Cut corn fodder, large silo No. 2, steamed	0.12		.51

The small silos hold very nearly three tons while the capacity of the large silos is approximately 20 to 25 tons of green material. From the above table it is seen that the acidity of silage not steamed varied from 1.01 to 1.94 and averaged 1.58 per cent. The acidity of the steamed silage varied from .30 to .88 and averaged .53 per cent. In other words the untreated silage contained three times as much acidity as did the steamed silage even though the silos in one or two instances were not properly steamed, and consequently the acidity higher than it would have been had the material in the silos been thoroughly heated.

Composite samples were obtained of the fresh material as the silos were being filled.

The acidity of the composite sample of silage representing the whole silo was obtained by determining the acidity in samples once or twice each week as the silage was being fed out of the silo. The average of the weekly determinations gave the composite for the whole silo.

II. A STUDY IN CROP ROTATIONS AND THEIR EFFECTS UPON THE SOIL.

This work is being pursued on the College farm in conjunction with the agricultural department. It consists of four one acre plats—each one of which is being farmed by a different system of rotation. The agricultural department is keeping a careful account concerning the farm operations on the four plats. The chemical department will make a study of the changes which take place in the soil on each of these plats.

The work has been under way four years. Each year composite samples of soil from each plat are carefully taken and saved for

future analytical work. This work should be continued at least 10 to 15 years before definite results can hope to be obtained.

III. THE EFFECTS OF SUMMER-FOLLOW.

This work has been under way since the fall of 1900 and consists of four galvanized iron pots 2x2½ feet. Each pot is water tight with the exception of a drainage tube in the bottom so arranged that all leachings can be saved and analyzed.

Pot I.—Bare summer-follow continually.

Pot II.—Bare summer-follow one year, then wheat—carefully saving all the straw and returning it to the soil. The next year summer-follow again, etc.

Pot III.—Bare summer-follow one year, then wheat—carefully saving all the straw, burning it and returning the ashes to the soil. The next year summer-follow, etc.

Pot IV.—Mixed farming—vetch, clover, alfalfa, etc.

The summers are warm and dry in the Willamette Valley and where the soil is thoroughly summer-followed the conditions are ideal for nitrification—that is, the decay or oxidation of organic matter and the formation of nitrates out of other forms of nitrogen in the soil. Most of the nitrogen in the soil is in an insoluble form and will not leach out. The nitrates which form, as a result of nitrification, are soluble and will run out of the soil just as soon as it becomes wet enough to leach. During the rainy season which occurs in late fall and winter the Willamette Valley soils are all more or less saturated with water and much leaching takes place.

Since 1900 all of the drainage waters from each of the four experimental pots have been analyzed. In this preliminary report the results obtained during the first part of the rainy season each year are as follows:

1901

Pot I	Pot II	Pot III	Pot IV
Summer-fallow during summer.	Grew wheat during summer; threshed and straw turned under.	Summer-fallow during summer; wheat sowed in fall.	Grew vetch during summer; crop turned under and reseeded.
Rate per acre Nitrogen lost during November..... 31. lbs.	6.07 lbs.	24.98 lbs.	8.93 lbs.

1902

Summer-fallow during summer.	Summer-fallow during summer; wheat sowed in fall.	Grew wheat during summer; threshed, straw burned and ashes turned under.	Grew vetch during summer; threshed, straw turned under and reseeded with vetch, clover and wheat.
Rate per acre Nitrogen lost during November..... 42.69 lbs.	36.99 lbs.	15.33 lbs.	20.18 lbs.

1903

	Summer-fallow during summer.	Grew wheat during summer; threshed and straw turned under.	Summer-fallow during summer; wheat sowed in fall.	Grew vetch and wheat during summer; threshed and mulched pot with straw.
Rate per acre nitrogen lost during November	18.48 lbs.	8.19 lbs.	21.18 lbs.	6.73 lbs.

1904

	Summer-fallow during summer.	Summer-fallow during summer; wheat sowed in fall.	Grew wheat during summer; threshed, straw burned and ashes turned under.	Cut clover on this pot and left on surface as mulch.
Rate per acre nitrogen lost during November	19.62 lbs.	20.46 lbs.	11.18 lbs.	12.51 lbs.

From the foregoing results it is seen that in the fall of 1901, during the first month in which leaching occurred, the summer-fallowed pots lost from three to five times as much nitrogen as did the pots not summer-fallowed. During succeeding years the summer-fallowed pots invariably lost considerably more nitrogen than did the pots which were growing crops.

This lost nitrogen if replaced by commercial fertilizers would cost the Oregon farmer from 20 to 25 cents per pound by the time he had replaced it in the soil. Many farmers have abandoned the practice of bare summer-fallow and grain, and yet at the present time there are thousands of acres in Oregon which are being bare summer-fallowed. The foregoing results should cause the farmer to stop and think and if possible abandon this suicidal practice.

IV. FRUIT AND VEGETABLE DRYING.

The Station has done considerable experimental work in the drying of fruit and vegetables and much data has been accumulated. The department hopes to issue this work in bulletin form.

V. HOP DRYING.

During the hop picking season of 1904 considerable work was done on the drying of hops. Hops were dried at different temperatures both with forced and natural draught. This work was carried on at the Gallagher hop yards, North Yamhill, Oregon. At this place two kilns were available for the work. The forced draught was obtained from a fan constructed by Mr. Gallagher. Careful measurements with a delicate anemometer showed that the fan when wide open and making from 200 to 230 revolutions per minute was capable of handling 2,222,000 cubic feet of air per hour.

The kiln with natural draught when working at its best, that is when the floor of hops is nearly dry and the heat has "broken through" the surface, handled from 300,000 to 400,000 cubic feet of air per hour.

When a floor of hops is first laid it is usually 24, 26 or 28 inches deep, and during the first few hours of the drying process the air in the kiln above the hops becomes saturated with moisture with almost no circulation to carry it out of the kiln unless the temperature in the hot air chamber below the floor of hops is raised extremely high—by this is meant 140 to 160 degrees Fahrenheit and in some cases even higher. One European authority says hops should never be heated higher than 100 to 104 degrees Fahrenheit. Forced draught prevents the overheating of the hops in the lower part of the kiln and keeps the air above the hops constantly and rapidly passing out of the ventilator.

Hops were dried, temperatures ranging from 110 to 140 degrees Fahrenheit. These different lots are being analyzed at the present time and the results obtained will be published as soon as completed.

VI-VII. PLANT FOOD AND ACID SOILS.

The subject of plant food and its availability is one of the main lines of work of the chemical department. In some cases soils are analyzed for total plant food, while in others the acid soluble only is determined. The results obtained being compared with the reported yields of crops on the fields from which the soil samples were taken.

Some work is also being done upon acid soils. Many soils in this State are quite acid; in some cases the acidity is so great that blue litmus paper is turned a bright red. At the present time some experiments upon acid soil are under way. The use of quicklime to destroy the acidity is being tried both in the field and in pots.

VIII. FERTILIZERS ON PRUNE TREES.

During the past four years experimental work has been carried on with fertilizers upon a five-acre Italian prune orchard belonging to Mr. B. W. Johnson. The orchard has been planted about 12 years and is located upon a slight rise of land. The soil would be classed as loam, most of it being thoroughly underdrained. Through the kindness of William S. Meyers of New York, materials were furnished for the experimental work. Fertilizers were applied in

the spring of 1901, 1902 and 1903, under each tree the materials being spread broadcast. Alternate rows through the entire orchard were treated. The results for 1901 were not recorded as the use of the fertilizers would not affect the trees so soon after application.

The crop in 1902 was light all over the Willamette Valley. In 1903 the crop was good throughout the valley, this five-acre orchard yielding better and larger fruit than many others in the valley.

Again in 1904 the crop was very light throughout the valley. During the growing season of each year no appreciable difference could be noticed in the appearance and growth of the fertilized and unfertilized rows.

The results obtained are as follows:

No. of row	Pounds Fertilizer per Tree	Average yield fresh prunes per tree		
		1902 pounds	1903 pounds	1904 pounds
1	2 nitrate of soda	9	141	22
2	No fertilizer	26	148	26
3	5 Thomas slag	47	145	38
4	No fertilizer	28	133	36
5	2 muriate of potash	36	125	27
6	No fertilizer	34	148	34
7	2 sulphate of potash	50	148	39
8	No fertilizer	28	142	38
9	2 nitrate of soda, 5 Thomas slag	46	171	53
10	No fertilizer	40	222	58
11	2 nitrate of soda, 2 muriate of potash	38	156	53
12	No fertilizer	33	138	44
13	2 nitrate of soda, 2 sulphate of potash	31	154	59
14	No fertilizer	29	138	54
15	5 Thomas slag, 2 muriate of potash	28	151	42
16	No fertilizer	30	143	42
17	5 Thomas slag, 2 sulphate of potash	37	168	43
18	No fertilizer	28	114	54
19	2 nitrate of soda, 5 Thomas slag, 2 muriate of potash	34	138	51
20	No fertilizer	23	116	45
21	2 nitrate of soda, 5 Thomas slag, 2 sulphate of potash	31	159	46
22	No fertilizer	33	135	45

From these results the average yield per tree is obtained:

1901 fertilized 35.2 lbs. fresh prunes; not fertilized 30.2 fresh prunes.

1902 fertilized 150.5 lbs. fresh prunes; not fertilized 143.4 fresh prunes.

1903 fertilized 43.0 lbs. fresh prunes; not fertilized 43.3 lbs. fresh prunes.

The average yield per tree for three seasons is as follows:

Fertilized 76.2 lbs. fresh prunes; not fertilized 72.3 lbs. fresh prunes.

These results would not indicate a very profitable use of fertilizers upon the prune orchard.

No marked effects of the different combinations of fertilizers could be noticed during the growing season.

Since the soil in this orchard is quite similar to many of the prune orchard soils, it would be well to be cautious about going into the wholesale use of fertilizers in similar orchards.

This fall if time will permit, the department hopes to analyze samples of fresh prunes grown upon trees that have received different kinds and combinations of fertilizing materials in order to ascertain whether the quality of the fruit has been affected. Special attention will be given to sugar and acidity in the ripe fruit.

IX. PROTEIN IN VETCH HAY. (VICIA SATIVA)

In the summer of 1903 preliminary work was started upon a study of protein in vetch hay. Samples of vetch were cut, when at the proper state for making hay, cured and analyzed. The per cent. of protein found in the water-free samples varied from 14.63 to 21.31 per cent. These results indicated considerable variation in the protein content of individual plants and suggested the possibility of improving and propagating a strain of vetch rich in protein.

In the fall of 1903 vetch seed were planted singly in hills about two feet apart. Vetch, if not too crowded tillers considerably. In the summer of 1904 when these vetch plants were at the proper state for hay making, a single shoot from each plant was carefully dried for analysis, whilst the remainder of the plant produced seed for future planting.

The results obtained in 1904 are as follows:

Number of plant	Per cent protein in water-free sample	Number of plant	Per cent protein in water-free sample
5	12.19	1	18 13
2	14.69	24	18.13
64	14.94	19	18.19
42	15.00	67	18.19
20	15.29	69	18 19
72	15.38	16	18.25
51	15.69	17	18.25
75	15.81	50	18.31
7	15.94	49	18 38
35	15.94	73	18.38
62	16.00	38	18.50
31	16.06	45	18.55
8	16.25	68	18.69
9	16.38	36	18.75
12	16.38	61	18.88
63	16.38	40	18.94
54	16.63	3	18.99
78	16.75	53	19.06
56	16.81	6	19.13
74	16.81	18	19.13
10	17.00	44	19.13
79	17.00	39	18.19
41	17.19	52	19.19
55	17.19	80	19.44
60	17.25	4	19.50
37	17.37	11	19.63
66	17.37	22	19.63
77	17.37	13	19.69
57	17.43	70	20.00
30	17.44	29	20.06
33	17.44	21	20.19
46	17.56	23	20.25
65	17.56	32	20.44
43	17.63	47	20.50
58	17.63	34	20.75
14	17.75	48	20.75
76	17.75	28	21.13
15	18.00	27	21.69
71	18.00	59	22.13
26	18.00	25	23.31

These results show that in the eighty samples analyzed the protein varied from 12.19 to 23.31 per cent. which is an extremely wide difference. Seed from the most promising plants were saved for planting. In some cases plants died or did not ripen seed so that they could not be propagated, but enough seed from plants rich in protein were saved to continue the work.

In the fall of 1904 seed were planted and the following summer samples from each plant were obtained, carefully dried and analyzed. The results obtained during the summer of 1905, when samples were cut for hay, are as follows:

	Number of plant	Wt. green	Wt. dry	Moisture	Number of immature pods	Protein in water-free sample of hay
		Grams	Grams	Per ct.		Per ct.
Parent Plant Number 19 containing 18.19 per cent. protein...	1	21.92	5.48	75 00	11	20.10
	2	38.05	9 80	74.24	12	16.75
	3	63.09	15 18	75.94	32	21.80
	4	24.85	6.29	74.16	17	22.12
	5	14 39	4.35	69.77	10	19 47
	6	44 07	12.75	71.06	17	12.12
	7	59.12	15.27	74 18	20	18.35
	8	55.02	14.78	73 13	27	15.75
	9	29.22	8.41	71.56	8	9.84
	10	33.23	7.20	78.30	0	11.73
Maximum 22.12, Minimum 9.84. Average 16.80.						
Parent Plant Number 21 containing 20.19 per cent. protein...	1	12.65	2.93	76.37	5	13 49
	2	12 63	3.98	68.49	10	18.68
	3	25.90	6 98	73 04	16	18.47
	4	71.98	18 99	73.20	40	17.63
	5	48 40	11 99	75 22	31	18.76
	6	43 78	11 30	74 18	33	19.64
	7	31.40	7 83	75 06	20	20.54
	8	Lost	----	-----	--	-----
	9	38.70	8 35	75 82	18	18.52
	10	26 10	7.75	70.30	17	12.09
	11	33.05	7 82	76 33	17	18.29
	12	41.40	10 45	74.51	20	17 52
Maximum 20.54, Minimum 12.09. Average 17.65.						
Parent Plant Number 23 containing 20.25 per cent. protein...	1	57.37	15 97	72.13	25	18.68
	2	142.70	30.47	79 34	57	19.21
	3	12.40	3 68	70 32	6	15 56
	4	12.45	3.37	72.93	8	22.73
	5	129.10	26 27	79.65	45	21.63
	6	21.38	5.22	75.58	1	17.80
	7	35.40	8.76	75.16	18	17.10
	8	28.40	5.79	79.61	5	23.20
	9	15 14	3 96	73.83	6	16.26
	10	60.65	11 94	80.31	13	21 73
	11	106.83	20.65	80.67	31	19.68
	12	Lost	-----	-----	--	-----
	13	63.60	16.01	74.82	29	17.52
Maximum 23.20, Minimum 15.56. Average 19.26.						
Parent Plant Number 25 containing 23.31 per cent. protein...	1	19.23	4.91	74.41	0	17.28
	2	46.90	14.68	68.69	27	16.65
	3	24.40	6.38	73.85	0	17.28
	4	23.42	5.87	74.93	0	20.31
	5	23 40	6.12	73.84	0	19.50
	6	7.40	2.25	69.59	0	19.70
	7	9.00	2.77	69.22	0	16.61
	8	35 45	7.37	79.21	0	20.31
	9	18.80	4.68	75.64	0	20.84
	10	12.70	2.78	78 11	0	20.45
	11	23.92	5.98	75.00	0	18.50
Maximum 20.84, Minimum 16.61. Average 18.86.						

	Number of plant	Wt. green	Wt. dry	Moisture	Number of immature pods	Protein in water-free sample of hay
		Grams	Grams	Per ct.		Per ct.
Parent Plant Number 27 containing 21.69 per cent. protein . . .	1	39.15	12.07	68.16	21	15.96
	2	44.16	11.47	74.03	9	16.08
	3	13.94	4.21	69.79	8	19.80
	4	30.69	7.72	74.81	13	18.72
	5	13.47	3.95	70.67	6	14.91
	6	22.62	6.22	72.50	13	19.24
	7	7.80	2.15	59.61	5	20.80
	8	18.28	4.95	72 91	11	19.56
	9	13.92	3.69	73.49	10	19.78
	10	22.85	6.00	73.74	10	17.41
	11	19.69	4.95	70.34	11	18.50
	12	10.39	2.82	72.86	11	18.65
Maximum 20.80, Minimum 14.91. Average 18.29.						
Parent Plant Number 28 containing 21.13 per cent. protein . . .	1	25.18	8.05	67.96	19	19.75
	2	45.76	12.74	72.15	27	20.75
	3	50.40	12.75	72.71	32	20.17
	4	11.10	3.50	68.48	8	18.68
	5	29.20	7.63	73.86	21	22.40
	6	19.98	5.05	74.72	12	20.47
	7	6 85	2.02	70.57	6	21.33
	8	8.58	2.49	70.97	6	23.57
	9	23 57	7.09	69.56	12	16.05
	10	8.50	2.59	69.52	5	21.36
	11	20.25	5.10	75.30	17	25.36
Maximum 25.36, Minimum 16.05. Average 20.90.						
Parent Plant Number 29 containing 20.06 per cent. protein . . .	1	26.38	5.72	78.31	24	22.12
	2	13.90	3.14	77.41	12	15.38
	3	17.03	4.15	75.63	11	19.17
	4	11.50	2.96	74.26	8	20.01
	5	19.40	4.70	75.77	10	19.12
	6	7.80	1.92	74.10	6	22.17
	7	10.40	1.97	72.21	0	20.80
	8	18.65	4.19	77.47	14	17.21
	9	50.60	10.13	79.97	33	22 01
	10	34.65	6.67	80.75	7	19.94
	11	38.93	9.42	73.20	18	13.59
	12	20.40	5.12	74.90	15	18 33
	13	Lost	----	-----	--	-----
	14	46.93	9.97	78.54	23	17.89
	15	16.70	4 07	75.62	12	17.01
	16	61.95	12.73	79.45	25	15.87
	17	57.10	12.60	77.93	35	20.05
	18	25.75	6 62	70.40	9	14.42
Maximum 22.17, Minimum 13.59. Average 18.53.						
Parent Plant Number 32 containing 20.44 per cent. protein . . .	1	32.10	8.27	74.23	24	21.14
	2	16.80	6.04	64.04	4	9.65
	3	72.63	19.09	73.71	40	17.89
	4	20 85	4.74	77.26	13	22.26
	5	13.55	3.78	72.10	11	20.14
	6	18.90	4.99	73.51	8	17.93
	7	27.95	7.77	72.20	18	17 19
	8	32.37	8.92	72.44	16	17.14
	9	13.63	3.60	73.58	11	17.68
	10	11.49	3.54	69.10	8	18.94
	11	54.90	12 57	77.10	30	21.01
	12	44.43	10.07	77.33	29	19.07
	13	25.90	6.69	70.30	18	19.22
	14	14.00	3.84	72.57	9	20.26
	15	55.14	13.30	75.87	48	21.89
Maximum 22.26, Minimum 9.65. Average 19.25.						

	Number of plant	Wt. green	Wt. dry	Moisture	Number of immature pods	Protein in water-free sample of hay
		Grams	Grams	Per ct.		Per ct.
Parent Plant Number 34 containing 20.75 per cent. protein . . .	1	Lost	-----	-----	--	-----
	2	Lost	-----	-----	--	-----
	3	91.02	22.71	75.04	41	19.96
	4	27.55	9.65	64.97	19	13.91
	5	71.05	17.10	77.31	48	22.15
	6	70.75	17.30	75.54	30	15.62
	7	8 90	2.29	74.26	10	20.68
	8	93.00	23.73	74.48	38	19.61
	9	59.00	14 32	75.72	28	19.56
	10	74 07	17.98	75.72	38	18.87
	11	86.62	21.30	75.29	39	18.59
	12	14.10	3.60	74.46	7	20 49
	13	43.42	10.30	76.24	14	18.72
	14	106.00	24.60	76 78	55	18.15
	15	55.90	15.55	72.18	22	12.36
	16	27.20	7.66	71.83	12	13.84
	17	18 09	5.81	67.88	9	16.05
	18	31.58	9.40	70.18	14	15.56
Maximum 22.15, Minimum 12.36. Average 17.76.						
Parent Plant Number 47 containing 20.50 per cent. protein . . .	1	35.73	9 90	72.26	25	14.19
	2	69.55	17.19	75.26	52	18.10
	3	23 76	5.97	75.71	24	20.80
	4	29 90	7 25	75.75	24	17.26
	5	38.73	8.80	74.69	25	18.45
	6	12 95	4.07	68 57	9	13.45
	7	13.00	4.05	68.84	9	16.40
Maximum 20.80, Minimum 13.45. Average 16.95.						
Parent Plant Number 48 containing 20.75 per cent. protein . . .	1	9.96	2.49	75 20	0	22.50
	2	13.41	3.20	76 13	6	23.06
	3	8.60	2.28	73.48	4	25.52
	4	15.65	4.77	69.52	10	16.49
	5	12.39	2.94	76.27	1	24.82
	6	7.67	2.22	71.05	7	21.49
	7	10.13	2.00	80 25	5	18.63
	8	15.04	3 94	73.80	11	20.61
	9	12.08	3.04	74.83	3	21.29
	10	23.20	5.30	77.15	2	19.56
	11	19.55	4.71	75.95	3	19.84
	12	14.80	3.42	76.89	5	24.89
	13	17.61	-----	-----	10	20.54
	14	15.72	3 76	76.07	7	19.03
	15	15.18	3.47	77.13	--	24.94
Maximum 25.52, Minimum 16.49. Average 21.55.						
Parent Plant Number 70 containing 20.00 per cent. protein . . .	1	24 60	7.74	68.53	1	12.73
	2	92 50	19.05	79.40	8	20.63
	3	24.28	4 99	79.44	4	22.49
	4	29.25	5.47	81.23	8	20.33
	5	22.40	4.32	80.71	3	17.89
	6	27.40	5.77	78.94	1	20.66
	7	26.25	6.96	73.48	9	14.98
	8	22.38	4.95	77.89	0	19.69
	9	61.83	12.20	80.26	7	19.84
	10	13.00	2.60	80.00	3	21.63
	11	133.93	33.09	75.20	0	17.61
	12	31.75	6.10	80.79	1	25.03
	13	19.10	4.33	77.33	7	20.75
	14	13 13	2 80	78.67	5	19.61
	15	29.05	4.05	86.05	0	19.52
Maximum 25.03, Minimum 12.73. Average 19.56.						

With but two exceptions some of the seed from last year's parent plants produced plants richer in protein than was the parent plant itself. In some cases nearly all the progeny from last year's parent plant are rich in protein; this is especially true of plants grown from seed from numbers 28 and 48.

The summary of the results thus far obtained upon the protein content of vetch based on water-free substance are as follows:

Year.	Number of Analyses.	Maximum Per ct. Protein Found.	Minimum Per ct. Protein Found.	Average Per cent. Protein Found.
1903	10	21.31	14.63	17.39
1904	80	23.31	12.19	18.03
1905	152	25.52	9.65	18.85

These results show that there has been, thus far, a steady increase in the per cent. of protein in the vetch hay. Two or three samples of this year's crop ran extremely low in protein, while many samples contained over 20 and a few, more than 25 per cent. protein. All determinations were made either in duplicate or triplicate, corrections being made according to blank determinations.

X. DIGESTIBILITY OF VETCH HAY AND CORN SILAGE.

During the year this department cooperated with the Agriculturist in carrying on digestion experiments with cattle.

This work involved many complete fodder analyses both of materials fed to, and feces produced by the animals. This work has been printed as Bulletin 85 of this Station. A statement of the summary contained in this bulletin is as follows.

Four feeding experiments were conducted with cattle from the Station herd.

Each experiment extended over a period of seven days.

Two of the experiments were conducted with vetch hay (vicia sativa) and two with corn silage.

The average results of these experiments are as follows:

DIGESTIBILITY OF VETCH HAY (VICIA SATIVA).

	Dry Substance.	Organic Matter.	Ash.	Protein.	Crude Fiber.	Nitrogen Free Extract.	Ether Extract or Fat
Per cent digested	66.05	67.35	52.23	69.91	57.56	71.59	71.21

DIGESTIBILITY OF STEAMED CORN SILAGE.

	Dry Substance.	Organic Matter.	Ash.	Protein.	Crude Fiber.	Nitrogen Free Extract.	Ether Extract or Fat.
Per cent. digested	73.08	75.09	47.98	55.03	75.34	75.65	89.91

The Station hopes to continue some digestion experiments during the coming Winter.

XI. ANALYSES OF SOILS FROM OLD APPLE ORCHARDS.

Many apple orchards in this State have been planted from 20 to 50 years. Generally they are more or less neglected, make poor growth and are not very productive. There is a popular notion in some sections that the present condition of these orchards is due largely to the fact that they have exhausted the soil of potash.

Samples of soil have been obtained from such orchards and also from adjacent fields and their analyses compared:

	2697	2698	2699	2700	2701	2702
	Upland orchard	Adjacent pasture	Orchard	Adjacent field	Orchard	Adjacent field
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Coarse material greater than ½ mm. diameter	1.40	1.30	3.60	1.90	1.40	2.90
Fine earth	98.60	98.70	96.40	98.10	98.60	97.10
ANALYSIS OF FINE EARTH [HCl 1.115]						
Nitrogen [N]	.11	.20	.06	.21	.09	.07
Phosphoric acid [P_2O_5]	.41	.53	.21	.21	.34	.18
Potash [K_2O]	.15	.20	.26	.12	.44	.39
Lime [CaO]	.37	.48	.80	.54	.32	.45
Magnesia [MgO]	.76	.41	.30	.27	.13	.13

The above soils came from the vicinity of Salem. With but two exceptions (numbers 2698-2700), they are low in nitrogen. There seems to be an abundance of phosphoric acid in all. In the first case the potash is lower in the orchard than in the adjacent pasture; in the other two cases the orchard soils contain more than the adjacent fields.

In soil number 2697 especially, the lime and magnesium are sadly out of proportion, the lime being much too small for the magnesium which is present. Applications of lime or wood ashes would be an excellent remedy for this fault.

Results obtained with soils from Sodaville are as follows:

ANALYSIS OF FINE EARTH [HCl 1.115.]	2244 Orchard Sandy loam	2245 Orchard Dark heavy loam	2246 Virgin pasture soil adjacent to orchards
	Per cent	Per cent	Per cent
Nitrogen [N]	.41	.41	.40
Phosphoric acid [P_2O_5]	.10	.19	.43
Potash [K_2O]	.19	.21	.25
Lime [CaO]	.69	.69	.57
Magnesia [MgO]	.47	.48	.44

In the foregoing analyses there is but slight difference between the orchard and pasture soils with reference to percentage of nitrogen, lime and magnesia. The phosphoric acid is over twice as high in the pasture as in the orchard soil; the potash also is somewhat higher in the pasture than in the orchard soil.

Results upon soils obtained from M. S. Shrock, Hubbard, Oregon, are as follows:

	2097 Orchard soil	2095 Old field	2096 New field
	Per cent	Per cent	Per cent
Coarse material greater than ½ mm. diameter	2.50	2.90	4.60
Fine earth	97.50	97.10	95.40
ANALYSIS OF FINE EARTH [HCl 1.115]			
Nitrogen [N]	.27	.07	.16
Phosphoric acid [P_2O_5]	.24	.38	.40
Potash [K_2O]	.08	.14	.30
Lime [CaO]	.28	.31	.45

Mr. Shrock writes that his orchard is stunted and lacks vigor. Analysis shows that the orchard soil is poor in potash and lime.

Liberal applications of wood ashes in connection with thorough cultivation and an occasional cover crop would be the best treatment for such a soil, not barring, however, the frequent use of the spray pump.

Concerning apple orchard soils in general it may be said that the potash content of their soils does not differ much from that of the adjacent fields. The average per cent. of potash (acid soluble K_2O) found in apple orchard soils was .22 per cent. The average found in the fields or pastures was .23 per cent. which is practically the same. There are exceptions to this general average as in the case of orchard soil analysis on this page.

The stunted growth, lack of vigor, etc., are due much more to neglect, than to a deficiency of plant food in the soil.

XII. ANALYSES OF IRRIGATION WATERS.

During the seasons of 1903-1904 Prof. F. L. Kent of the agricultural department studied irrigation in Klamath county. In connection with this work the chemical department made the following analyses of irrigation waters:

	PARTS PER MILLION.				
	1904			1905	
	2598	2599	2601	2760	2759
	Little Klamath Lake.	Adams Ditch.	Ankeny Ditch.	Adams Ditch.	Ankeny Ditch.
Total solids [110°C]	807.0	467 0	128.0	369.6	174.4
Organic matter	76.0	93.0	-----	80.0	60.0
Silica [SiO_2]	34.0	16.0	37.0	46.0	40.0
Sodium chloride [NaCl]	50.9	75.4	50.9	28.0	12.5
Sodium carbonate [Na_2CO_3]	49.0	133.7	20.9	148.4	31.8
Sodium sulphate [Na_2SO_4]	10 5	5.5	5.5	35.5	42.5
Calcium carbonate [$CaCO_3$]	125 0	107.5	50.0	38.0	35.2
Magnesium carbonate [$MgCO_3$]	---	21 7	---	63.4	---
Nitrogen [N]	8.4	9.3	6.2	2.6	2.1
Iron and alumina [Fe_2O_3-Al_2O_3]	-----	---	----	---	2 9

For grains per gallon use the divisor 17.12.

The details of the irrigation work have been published by Prof. F. L. Kent in Bulletin 86 of this Station.

XIII. FERTILIZING VALUE OF WASTE PRODUCTS FROM CANNERIES AND MANUFACTURING ESTABLISHMENTS.

Last year considerable data were procured but is not yet in shape for publication. It is hoped not only to obtain the amounts but to make analyses and thus find the fertilizing value of these materials most of which at the present time are thrown away.

XIV. THE EFFECTS OF THE USE OF LIME IN THE STRAW HEAP.

XV. THE ACTION OF LIME AND POTASH SALTS ON WILLAMETTE VALLEY SOILS.

The work relating to the effect of lime in the straw heap will be finished this fall. This work was started in September 1902, when straw heaps both with and without the addition of quicklime were exposed to the weather. In the near future these straw heaps will be moved and examined and analyses made and compared with those made at the beginning of the experiment. In this way it is hoped to ascertain the effects of lime on straw.

The work relating to the action of lime and potash salts on Willamette valley soils has not yet been started, but will probably form one of the new lines of Station work.

XVI. MISCELLANEOUS WORK.

This includes various kinds of work, among the most important of which are soil analyses. During the year the following soil analyses have been made:

Laboratory number	SENDER	Coarse material greater than ½ mm. in diameter	Material ½ mm. or less in diameter	Analysis of Fine Earth					
				Total Nitrogen [N]	Plant food soluble in HCl, Sp. Gr. 1.115				Iron and Aluminum Oxides [Fe_2O_3-Al_2O_3]
					Phos. acid [P_2O_5]	Potash [K_2O]	Lime [CaO]	Magnesia [MgO]	
		Per ct		Per cent					
2513	Jas. Pitt, Oswego	2.40	97.6	.12	.24	.19	.71	.56	.....
2525	J. L. Carter, Hood River	.....	.....	.10	.19	.21	.68	.87	26.96
2539	I. M. Simpson, Suver	.60	99.40	.20	.26	.20	.78	.85	12.68
2554	J. C. Welcome, Burns	.....	.....	.29	.14	.28	1.11	.56	8.45
2591	F. A. Jones, Portland	17 20	82.80	.13	.45	.10	.94	.48	.....
2592	F. A. Jones, Portland	30 20	69.80	.24	.23	.18	.29	.11	.....
2616	Ore. Land & Water Co., Umatilla	30.40	69.60	.19	.20	.51	1 26	.90	7.70
2617	Ore. Land & Water Co. Umatilla [river sediment]	.10	99.90	.19	.22	.30	.84	1.27	9.78
2618	Ore. Land & Water Co. Umatilla	32.80	67 20	.07	.20	.13	1.22	.79	7 23
2619	Ore. Land & Water Co. Umatilla [river sediment]	.10	99.90	.27	.21	.25	1 98	1 31	13.49
2621	Ore. Land & Water Co. Umatilla	10.30	89.70	.04	.19	.17	1.09	.71	6.05
2627	Col. Southern Irrigation Co., Deschutes	15 30	84.70	.22	.12	.19	1 18	.29	10.28
2623	B. W. Rice, Payette, Eastern Oregon soil	.40	99.60	.09	.23	1 16	1.92	1.00	14.52
2635	Ida Caxton, Shaw	3.00	97.00	.41	.38	.1	.54	.33	25 57
2637	H C. Ehlen, Aurora [hopyard]	1.00	99.00	.11	.31	.17	.48	.46	10.99
2638	H. C. Ehlen, Aurora [virgin soil]	1 10	98.90	.13	.39	.16	.67	.59	9 97
2644	V. E. Grousbeck, Creswell	13.40	86.60	.36	.20	.26	.76	.73	14.52
2649	John H. Hall, Portland	1.10	98.90	1.44	.41	.12	.67	.28	11.52
2650	John H. Hall, Portland	2.10	97.90	.96	.34	.16	.94	.29	4 91
2656	L. C. Metzger, Gresham	2 30	97.70	.34	.16	.09	.55	.60	9 89
2658	M. W. Cooper, Lake Labish bottom land	7.40	92.60	.42	.38	.10	2.89	.66	4 91
2689	J. L. Tousey, Portland	10.30	89.70	.30	.36	.18	.59	.18	15.63
2690	J. R Howard, Prineville	.....	.....	.20	.26	.28	1 44	.55	8.76
2691	J. R. Howard, Prineville	.....	.....	.24	.30	.43	.91	.89	12.17
2710	Will Hutchens, McMinnville	.40	99.60	.94	.43	.43	.53	.....	13.30
2751	John E. Ostrom, Medford—fiirst foot	.....	.....	.21	.18	.43	.45	.....	.....
2752	John E. Ostrom, Medford—second foot	.....	.....	.16	.39	.26	.45	.....	.....
2753	John E. Ostrom, Medford—third foot	.....	.....	.14	.10	.27	.41	.....	.....
2754	Col. Southern Irrigation Co., Deschutes	31.05	68.95	.05	.31	37	1.40	.95	11.33
2755	Col. Southern Irrigation Co., Deschutes [subsoil]	28.00	72.00	.05	.27	.39	1.41	1.05	10 83
2758	W. H. Goyne, Tillamook	1.23	98.77	.63	.38	.38	.24	.79	17.57
2781	B. F. Laughlin, North Yamhill	.17	99.83	.05	.09	.34	.31	.91	10.98
2838	J. A. Woolery, Ione	.10	99.90	.08	.22	.39	.67	.80	7 95
2841	C. N. Wonacott, Firwood	57 50	42.50	.09	.14	.13	.85	.48	18 89
2843	L. D. Smith, Creswell	2.92	97.08	.24	.25	.38	.77	.44	26.50
2844	F. Haberlach, Clackamas	.47	99.53	.14	.34	.27	.91	.35	12.97
2847	E. L. Wonacott, Firwood	7.42	92.58	.25	.25	.44	.74	.58	21.78
2848	J. M. Smith, Creswell	5.26	94.74	.21	.24	.14	.43	.35	23.46
2854	Sam Egger, Waldo	2.40	97.60	.53	.16	.26	.88	.46	7.73
2855	J. H. Reid, Milwaukie	.70	99.30	.06	.39	.52	.69	.67	9 83
2869	Deschutes Irrigation & Power Co. Bend—1st foot	21 80	78.20	.06	.25	.31	.68	.76	10.22
2870	Deschutes Irrigation & Power Co. Bend—2d foot	19.40	80.60	.03	.30	.27	.68	.78	9 77
2871	Deschutes Irrigation & Power Co. Bend—3d foot	17.50	82.50	.02	.22	.43	1 10	.69	11.23
2921	Chas. S. Moore, Salem [sagebrush soil]	7 45	92.55	.19	.24	.97	1.35	1.24	11.73

From these analyses it will be seen that in general the soils of Oregon are rich. An average amount of nitrogen and phosphoric

acid would probably range from .10 to .20 per cent. Soils containing more than this would be considered rich whilst those containing less would be considered poor in nitrogen or phosphoric acid as the case may be.

Beaver dam soils contain from less than one to over two per cent. nitrogen.

An average amount of acid soluble potash in the soil would probably be from .20 to .30 per cent. Greater amounts than this indicate an abundance while a smaller amount means that the soil would be much benefited by increasing the amount of available potash present.

In some cases the per cent. of lime in the soil is quite low, but in general the amount seems to be sufficient for crop purposes.

Magnesium should always be intimately associated with lime in in the soil. Magnesium in considerable excess of lime acts as a poison to plants,* on the other hand too much lime and too little magnesium is detrimental to plant growth. It has been suggested that the best proportion of soluble lime to soluble magnesium for the germination and growth of plants is about 7 parts by weight of lime and 4 parts magnesium. The magnesium seems to be necessary to make it possible for the plant to assimilate phosphoric acid.

The following insecticides have been examined:

Laboratory Number.	Substance.	Sent by	Moisture Per ct.	Total Arsenic [As_2O_3] Per ct.	Soluble Arsenic [As_2O_3]	Ash per cent.	Carbon Bi-Sulphide.
2651	Sulp'r	S. D. Evans, Umpqua Ferry				.025	Soluble
2653	"	I. A Dean, Riddle				.70	Soluble
2712	White Arsenic	Chas. N. Clarke, Hood River	.08	99.77			
2716	"	Sears and Porter, " "		100 00			
2717	"	G. E. Williams, " "		99.65			
2742	"	Chas. N. Clarke, " "		99.35			
2775	"	" " " "		99.00			
2778	"	J. L. Carter, " "		99.46			
2779	"	" " " "		99.34			
2790	"	H. C. Atwell, Forest Grove		99.50			
2851	"	Chas. N. Clarke, Hood River		99 60			
2852	"	G. E. Williams, " "		99.90			
2858	Paris green	Frank Brown, Roseburg		55.56	1.49		
2859	Lond'n purple	Frank Brown, Roseburg		21.45	3.72		
2923	Paris green	C. H. Lewis, Medford		55.69	1.55		

The few analyses that have been made indicate that the insecticides used in this State are well up to the standard.

In some sections of the West wild oats (*Avena fatua*) grow very abundantly. Typical samples were obtained at different stages of maturity and analyzed with the following results:

*The relation of lime and magnesia to plant growth, by O. Loew and D. W. May, U. S. Dept. Agr. Bureau of Plant Industry.—Bulletin 1.

	Analyses Fresh Material.					Analyses Water-free Material.				
	2609	2610	2611	2612	2613	2609	2610	2611	2612	2613
	Not headed	Beginning to head	Little too green for hay	Just right for hay	Over-ripe for hay	Not headed	Beginning to head	Little too green for hay	Just right for hay	Over-ripe for hay
Per cent Moisture	71.33	66.31	65.21	61.11	53.22					
" Dry material	28.67	33.69	34.79	38.89	46.78	100.00	100.00	100.00	100.00	100.00
" Ash	2.12	2.49	2.61	2.78	3.69	7.39	7.38	7.50	7.14	7.89
" Protein [N x 6.25]	2.44	2.59	2.24	2.72	3.07	8.50	7.69	6.44	7.00	6.56
" Crude fiber	5.37	8.53	8.54	9.20	11.27	18.73	25.32	24.55	23.65	24.09
" Nitrogen-free extract	17.81	19.06	20.17	22.61	26.74	62.12	56.58	57.96	58.14	57.16
" Fat [ether extract]	.93	1.02	1.23	1.58	2.01	3.26	3.03	3.55	4.07	4.30

These results indicate that wild oats are considerably richer than average timothy hay; nearly as rich as Kentucky bluegrass or redtop, and compares favorably with orchard grass and ordinary oat hay.

Two samples of forage plants were received from the Eastern Oregon Experiment Station for analysis; both were in excellent condition, one being common alfalfa and the other locally called "blue clover" (*Melilotus coerulea*).

	2756—Alfalfa.		2757—Melilotus Coerulea.	
	Air Dry Sample.	Water-free sample.	Air Dry Sample.	Water-free Sample.
	Per ct.	Per ct.	Per ct.	Per ct.
Moisture	9.18		11.63	
Dry material	90.82	100.00	88.37	100.00
Ash	8.26	9.10	7.98	9.03
Protein [N x 6.25]	15.21	16.75	19.17	21.69
Crude fiber	24.35	26.81	22.44	25.40
Nitrogen free extract	40.76	44.88	36.71	41.54
Fat	2.24	2.46	2.07	2.34

These analyses show that the sample of alfalfa is somewhat richer than the average, and that the so-called blue clover is a plant exceedingly rich in protein.

At the request of Dr. D. G. Fairchild of the U. S. Department of Agriculture several samples of barley were examined for protein:

Lab No.	Variety.	Moisture.	Dry Substance.	Protein in Original Samples.	Protein in Water-free Samples.
		Per cent.	Per cent.	Per cent.	Per cent.
2766	Hulless	7.65	92.35	12.71	13.76
2767	Highland chief	8.35	91.65	12.34	13.47
2768	Swanskolekow	7.15	92.85	13.82	14.89
2769	Chevalier	8.19	91.81	12.41	13.52
2770	Webbs-Burton malting barley	8.72	91.28	13.16	14.42
2771	Mansbury	8.38	91.62	12.73	13.89

A few samples of concentrated feeding stuffs have been examined for parties interested in stock feeding:

Laboratory number	KIND OF FEED	SENT BY	Air Dry Substance							Water-free Substance					
			Moisture	Dry material	Ash	Protein [N x 6.25]	Crude fiber	Nitrogen-free extract	Fat	Dry Material	Ash	Protein [N x 6.25]	Crude fiber	Nitrogen-free extract	Fat
			Per cent							Per cent					
2607	Mill feed No. 1	R. Scott, Milwaukie	10.61	89.39	4.46	8.99	10.29	60.97	4.68	100.00	4.99	10.06	11.51	68.20	5.24
2608	" No. 2	" "	8.75	91.25	4.38	8.88	13.51	58.60	5.88	100.00	4.80	9.73	14.81	64.22	6.44
2673	"	M. M. Waterman, The Dalles	10.22	89.78	4.48	11.93	22.96	43.37	7.04	100.00	4.99	13.29	25.57	48.31	7.84
2686	Oat chop	College Farm, Corvallis	10.22	89.78	3.73	11.56	13.01	55.81	5.67	100.00	4.15	12.88	14.49	62.17	6.31
2761	Prepared cattle food	Hazlewood Creamery, Shedd	6.23	93.77	5 36	8.56	16.96	59 21	3.68	100.00	5.72	9.13	18.09	63.14	3.92
2762	U. S. Dairy chop [white]	Wm. Schulmerich, Farmington	4.76	95.24	4.05	10.06	12 11	63 47	5.55	100.00	4.25	10.56	12.72	66.64	5.83
2763	" " [gray]	" " "	4.78	95.22	3.14	9.17	8.10	68.00	6.81	100.00	3.30	9.63	8.51	71.41	7.15
2850	Gluten feed	Acme Mills Co., Portland				63.13									
	Wheat bran average		11 91	88.09	5.78	15.42	8.99	53.87	4.03	100.00	6.60	17.40	10.20	61.30	4.50

These prepared mill products, with the exception of the gluten feed, when compared with average wheat bran (see last analysis), will be found to be much poorer in protein than is the wheat bran. True, most of them are richer than bran in fat, but at the same time those that have been analyzed are probably not so valuable.

Mineral and spring waters have been examined and the following data obtained:

Lab No.	SENT BY	Parts Per Million Parts of Water.															
		Total Solids.	Loss on Ignition.	Insoluble Residue.	Silica.	Sodium Chloride.	Sodium Sulphate.	Potasium Chloride.	Magnesium Chloride.	Magnesium Sulphate.	Magnesium Carbonate.	Calcium Chloride.	Calcium Sulphate.	Calcium Carbonate.	Iron and Alumina.	Organic Matter and Combined Water.
2585	R. M. Hall, Portland	562.			50.	178.					70.	94.		50.	120.	
2593	Chas. W. Buell, Sheridan	49300.				20435.			110.			22840.				
2624	C. J. Carstens, Gaston	2790.		24		1850.8				55.		465.4				307.
2683	E. W. Crichton, Portland	58852.				17982.				292.		25862.			60.	
2764	A. B. Marquam, Tiller	187.	59.6	26.		4.6		1.1			13.4	43.4	6.	52.3	1.8	39.4
2780	Henry Gray, Cascade Locks	2129.2	202.	55.4		413.8		36.		235.5	403.	59.		635.		89.2
2837	H. Johnson, Lafayette					13330.		785.	65.9			37691.6				
2842	E. N. Hale, Hillsboro	229.	56.	60.	60.							16.		109.	10.	34.
2881	W. J. May, Baker City	256.	48.		73.2	198.2	3.3	6.5						8.2		
2890	R. F. Platt, Portland	126.		32.		8.3		9.3		22.5				26.3		
2894	Laura L. Batchelder, Hood River	137.		51.		33.9		1.7		30.				30.4		

The geological formations underlying Oregon are such that many of the spring waters are highly charged with mineral matter. One class of spring waters coming from entirely different localities are very similar in composition. They carry an excessive amount of dissolved mineral salts which consist almost entirely of calcium and sodium chlorides. It is probable that Oregon contains many springs possessing desirable medicinal properties.

ANALYSES MADE DURING THE YEAR.

The laboratory work requires much time and patience and great care in manipulation. Some estimations require but a short time while others, such as the determination of potash and crude fiber, require several days.

The work performed during the past year is as follows:

Number	of	determinations	of	moisture 166
"	"	"	"	solids 149
"	"	"	"	ash 83
"	"	"	"	protein 263
"	"	"	"	crude fiber 34
"	"	"	"	ether extract 38
"	"	"	"	nitrogen free extract 30
"	"	"	"	acid in silage 18
"	"	"	"	acid in soil 2
"	"	"	"	acid in vinegar 9
"	"	"	"	nitrogen 319
"	"	"	"	potash 179
"	"	"	"	phosphoric acid 121
"	"	"	"	iron and aluminum oxides 74
"	"	"	"	magnesium oxide 143
"	"	"	"	calcium oxide 180
"	"	"	"	silica 15
"	"	"	"	humus 14
"	"	"	"	sulphuric acid 34
"	"	"	"	soda 19
"	"	"	"	fine earth 82
"	"	"	"	gravel 82
"	"	"	"	coloring matter (dye) 1
"	"	"	"	casein 4
"	"	"	"	fat in milk 10
"	"	"	"	volatile acids in butter 2
"	"	"	"	chlorides 38
"	"	"	"	solids in potable waters 32
"	"	"	"	free ammonia 6
"	"	"	"	albuminoid ammonia 6
"	"	"	"	nitrates 17
"	"	"	"	nitrites 17

Number of determinations of arsenious acid in Paris green	4
" " " " " " " white arsenic	12
" " " " " " " London purple	2
" " " " gluten in feed	1
" " " " carbonates	16
" " " " alcohol	1

Much of the time of the chemist is devoted to miscellaneous work which consists largely of analyses of soils, insecticides, food materials, spring and well waters.

More satisfactory work could be accomplished if the chemist were provided with an assistant, who could devote his whole time to Experiment Station chemical analyses. This would relieve the chemist of much of the routine work and thereby give him a chance to undertake more investigation and research.

During the past year the chemist spent no time in teaching, except during two months of the Farmer's short course, when the class met daily (with but few exceptions) to receive instruction in agricultural chemistry.

During the year some weeks were spent in Farmer's Institute work.

Mr. C. M. McKellips assisted in the Experiment Station chemical department two months; Mr. F. E. Edwards assisted three months and Mr. Bert Pilkington, a senior in college, was employed at irregular intervals as a scientific aid.

Although the chemist's assistants have been crowded with college duties they have been able to do some Station work.

Whatever there is of value that has been accomplished during the past year is due in part to the faithful, painstaking work of these assistants.

The foregoing report is very respectfully submitted,

A. L. KNISELY, Chemist.

DEPARTMENT OF ENTOMOLOGY AND PLANT DISEASES.

I hereby submit a brief synopsis of the work of the Department of Entomology and Plant Diseases for the year ending June 30, 1905:

I. APPLE SCAB.

Cooperative spraying experiments for this disease were conducted in the orchard of Mr. John Meeker on College Hill. These experi-

ments were in continuation of those conducted last year and reported in detail in my report for 1904.

II. APPLE TREE ANTHRACNOSE.

Work on this disease which was begun in 1899 is still being continued. Notes on its distribution, the susceptibility of different varieties to its attacks, the effect of varying climatic conditions on its virulence, etc., are being accumulated, as is also considerable evidence in favor of the Fall spraying with Bordeaux, which was recommended in Bulletin No. 60.

III. PRUNE LEAF-CURL.

Work on this disease, which was begun in 1901, is still being continued. The principal results obtained seem to prove that the theories of the cause of the disease which have thus far been advanced are untenable and indicate that the trouble is of a physiological rather than a parasitic nature.

IV. SAN JOSE SCALE.

This pest has been under more or less continuous observation since my first connection with the Experiment Station and a somewhat extended account of it was published in an article on Prune Pests in Bulletin No. 45, and also in the report of the State Board of Horticulture for 1899. In my last report I mentioned some cooperative experiments which I had conducted in the orchard of Mr. S. D. Evans at Umpqua. The past year through the courtesy of the manager, Mr. Robert Johnson, I was permitted to duplicate these experiments in the large orchard of the Benton County Prune Company. The results of the two seasons work will soon be ready for the press.

V. HESSIAN FLY AND OTHER WHEAT PESTS.

A considerable quantity of notes have been accummulated regarding the distribution and prevalence of wheat pests in the State with the expectation of issuing a bulletin upon the subject at some future date.

VI. MISCELLANEOUS OBSERVATIONS AND NOTES.

Under this head is included brief notes from correspondence and scattered observations on more than 250 different species of injurious insects and fungi. In many instances these notes represent only scattered observations on a species; in others they cover more or less extensive breeding cage or field observations. This feature of the work becomes more valuable as time passes but is not in evidence

until the excessive abundance of some insect or disease creates a general desire for information regarding it.

Along with the notes a large number of photographs of insects and fungi, and their work have been taken for use in future publications.

A. B. CORDLEY.

DEPARTMENT OF DAIRYING.

CORVALLIS, OREGON, June 30, 1905.

Director James Withycombe,

SIR:—I have the honor to submit herewith report of the work of the Dairy section of the Agricultural Department for the fiscal year ending June 30, 1905.

The earliest work of the year consisted of irrigation investigations in Klamath County in cooperation with the U. S. Department of Agriculture. The month of July, and the greater part of the month of August was taken up with this work, the results of which have been published as Bulletin No. 86 of this Station. In this connection may properly be mentioned attendance at the State Irrigation Congress at Ontario on September 20-22, 1904.

The first half of the month of September was devoted to work at, and in connection with, the Oregon State Fair. Early in October the Wallowa county fair at Enterprise was attended, about one week's time being consumed in connection therewith. In fact the outside demands upon my time in connection with Farmers' Institutes and other meetings of a similar character, prior to January 1, 1905, were so great as to practically preclude any regular local Station work. The number of Farmers' Institutes alone during the year aggregated eighteen, an average of two days time being required for each.

The work of testing cows at the W. S. Ladd estate, for eligibility to the American Jersey Cattle Club's Register of Merit has been continued throughout the year. During this time forty different cows have been under test, there having been as many as thirty-one in a single month. This work contemplates a year's record for each cow. Some few have early shown their inability to make the required record, and have been dropped after a few monthly tests. Several others have already completed a year's record, many of these having made the butter fat production required for eligibility to the

Register of Merit. This work has been conducted without expense to the Station other than the time required on my part as tester. Three days are required for making the tests, and the necessary travel, and another day for the compilation and reporting of results, or a total of four days in each month.

Some investigation has been carried on with regard to the value of paraffin in the curing of cheese. It has been shown that this substance can be applied to newly made cheese very easily and cheaply, improving the quality and lessening the waste. The results of this investigation have been embodied in a thesis written by Mr. O. G. Simpson who assisted in the work.

Under the direction of this department Mr. Ira P. Whitney investigated the efficiency of cream separators under farm conditions, the results also being embodied in a thesis. This investigation developed the fact, among others, that the average farmer does much closer skimming with his machine in summer than in winter.

In connection with the dairy school work the testing of the different makes of hand cream separators has been carried on. Seven different manufacturing concerns, and an aggregate of eight machines have been represented in this work.

The work in connection with the Station dairy herd has been limited to the matter of records. A daily record of the milk yield of each cow is on file, and a weekly composite sample has been tested for butter fat. These herd records have been carefully kept for a number of years and are gradually becoming more valuable as additional data is obtained.

The testing of samples of milk and cream for outside parties increases each year. During the past twelve months the number of such tests approximates one hundred.

Cooperatively with the Department of Bacteriology some investigations have been continued relative to the handling of butter and cheese in tin packages. The investigations of the past year have had to do with what might be termed a curing box, rather than with an individual package. While the results so far obtained have been very gratifying, the number of trials have not been sufficient to warrant the drawing of any definite conclusions.

Respectfully submitted,

F. L. KENT.

DEPARTMENT OF BACTERIOLOGY.

During the year ending June 30, 1905, the major work in this department, has been experiments in canning fruits and vegetables by low temperature, or, sterilizing by intermittent pasteurization, and a study of the organisms which cause the deterioration of canned goods.

The object in view is to preserve the material in its natural condition, without breaking down tissue, coagulating albuminous matter, or destroying flavor by driving off the essential oil with excessive heat, as commonly practiced in canning establishments.

The method briefly described is; fill the cans with raw material and water, then after soldering on the cap with vent left open, the material is heated to 160 degrees F. at which temperature it remains for fifteen minutes. Upon removing the cans from the steam-chest, the vent is immediately closed with solder and a partial vacuum is formed in the can when cooled. This first heating, with vent left open, expels all air from the can and at the same time destroys most of the organisms which are in their vegetative state. In order to kill the spores, the cans are allowed to remain in a moderately warm temperature for twenty-four hours, to induce them to germinate, and lose their heat resisting power. The cans are then heated again as before and the operation repeated the following day for the third time, which renders the material germ free.

The results thus far have been very satisfactory with green beans, wax beans, tomatoes, cauliflower, asparagus and cherries, all of which retained their natural flavor and color. Some trouble has been experienced with corn and peas owing to an anaerobic spore-bearing germ, of greater resistance, and an especial study was made of these organisms with reference to their thermal deathpoint. The work is being continued.

Apple cider and other fruit juices, bottled and treated by this method, have remained perfectly sweet, retaining their natural flavor without acquiring a cooked taste.

Of 320 quart bottles so treated last fall, not one fermented, or was in any other way changed from a normal condition.

Some experimental work was done in preserving butter which, so far, has given good results; a tin box was constructed of dimensions to contain nine two-pound rolls of butter, and was provided with a lid made to fit into a flange on the outside. After paraffining the inside, the box was filled with butter, and lid sealed in place by pouring hot canning wax into the flange, hermetically sealing it.

The box was filled March 2nd and opened April 8th when the butter was found to be sweet and in excellent condition. One roll was kept out and placed on a plate to ascertain if it would deteriorate more rapidly then a check roll, which has been made from the same lot and exposed to the air.

The box, minus one roll, was again sealed and replaced where it had been kept before, in a cool place, with a check roll and the one which was removed from the box.

On June 21st the box was again opened and butter tested, it was found to be still in good condition and quite marketable. The original check roll was very rancid and covered with salt crystals. The roll taken out at the first opening of the box was much better preserved than the check, but it was slowly becoming rancid.

The only objection to this method so far as noted, was a small accumulation of water in the bottom of the box, which can be obviated. There is no other shrinkage, nor incrustation of salt on the wrapper paper.

This experiment in a small way has demonstrated that the rancidity of butter is evidently due to the activities of aerobic germs, decomposing the buttermilk and albumen in the water which the butter contains.

If further demonstrations prove as satisfactory as this one has done, the incrustation of salt on butter kept in cold storage may be overcome as well as loss of weight by evaporation, and butter may be kept sweet for a long period of time, in a moderate temperature.

All the specimens of diseased animals and fowls received at the laboratory were given prompt attention, but no serious outbreak of bacterial disease was found. Respectfully submitted,

E. F. PERNOT.

DEPARTMENT OF HORTICULTURE AND OLERICULTURE.

To the Director of the Oregon Experiment Station,

DEAR SIR:—I have the honor to present herewith the report of the work in the Horticultural Department for the past year.

At the opening of the year the work of taking care of the Experimental orchard was again assigned to me until someone was appointed to take charge of the work. But owing to the fact that no one has been appointed, the work has fallen to me during the whole year. With the assistance of Mr. W. Wicks, I have been able to prosecute the work fairly well.

In addition to the above I have had charge of the hop yard which is planted with varieties secured from the Department of Agriculture and are being grown in cooperation with the said Department.

ORCHARDS.—There have been a great number of varieties of newly introduced apples grafted, and the young trees set out in the orchard in places where they were needed to fill up blank places, which had been caused by trees dying out. Also a number of trees have been top grafted. These have been principally Ben Davis worked with Cox's Golden Pippin and a few native crabs have been worked onto the Ben Davis stock.

The trees on the west of the orchard have been thinned out in

order to make them more uniform. These trees were planted for Professor Cordley's use and consequently were set too close for a permanent plantation, thus the cause for thinning out.

All trees have been well cared for in the way of winter pruning, as well as the plowing and putting the surface of the ground in good condition by frequent cultivation.

All varieties of fruits have been cared for during the year and notes taken on same.

I have been working in connection with the Department of Agriculture for three years and am still carrying on the work of recording the date of blooming, the date of leaf bud opening, the date of terminal buds forming and the ripening of each variety of fruit.

Cabbage.—There has been finished up and reported upon during the early part of the year the testing of 39 varieties of cabbage. The above crop was disposed of at two cents per pound in most cases.

Gardens.—The old strawberry plants have been plowed up, the ground well manured, also other parts of the garden plats.

Potatoes.—There have been 49 varieties of potatoes received from the Department at Washington; each variety being introduced from England, except in a few cases supposed to have originated with the Department.

Besides the above, twenty-three varieties have been handed to me from the Agricultural Department of the College, making in all seventy-three varieties. Very careful notes have to be taken on the above during the growing season, thus entailing a great deal of time and labor.

Corn.—Two long rows of sweet corn have been planted, namely the Vorhees, a new corn sent out last year for testing, and having been found very promising all the seed was saved from the few plants last year and planted this season. It is very valuable owing to its great earliness.

Cucumbers.—These have been sown very plentifully, the seeds of a new variety having been sent here by the Atlee Burpee Seed company for testing.

Brocoli.—Experiments have been conducted with this grand winter vegetable for the purpose of determining if it be possible to mature seed. I am glad to say that for two years I have been successful in maturing this crop. This, of course, is only in a small way but it goes to show that it is possible to raise seed in this location. The only drawback is that in order to be perfectly true, it would be advisable not to permit the wild mustard to bloom in the vicinity as the plant becomes contaminated with the mustard and it is very apt to show the effects.

I have quite a deal of Scotch Kale seed maturing. This I have placed far from any other variety of the family, so am in hopes of being able to obtain some true seed.

Respectfully submitted, GEORGE COOTE.